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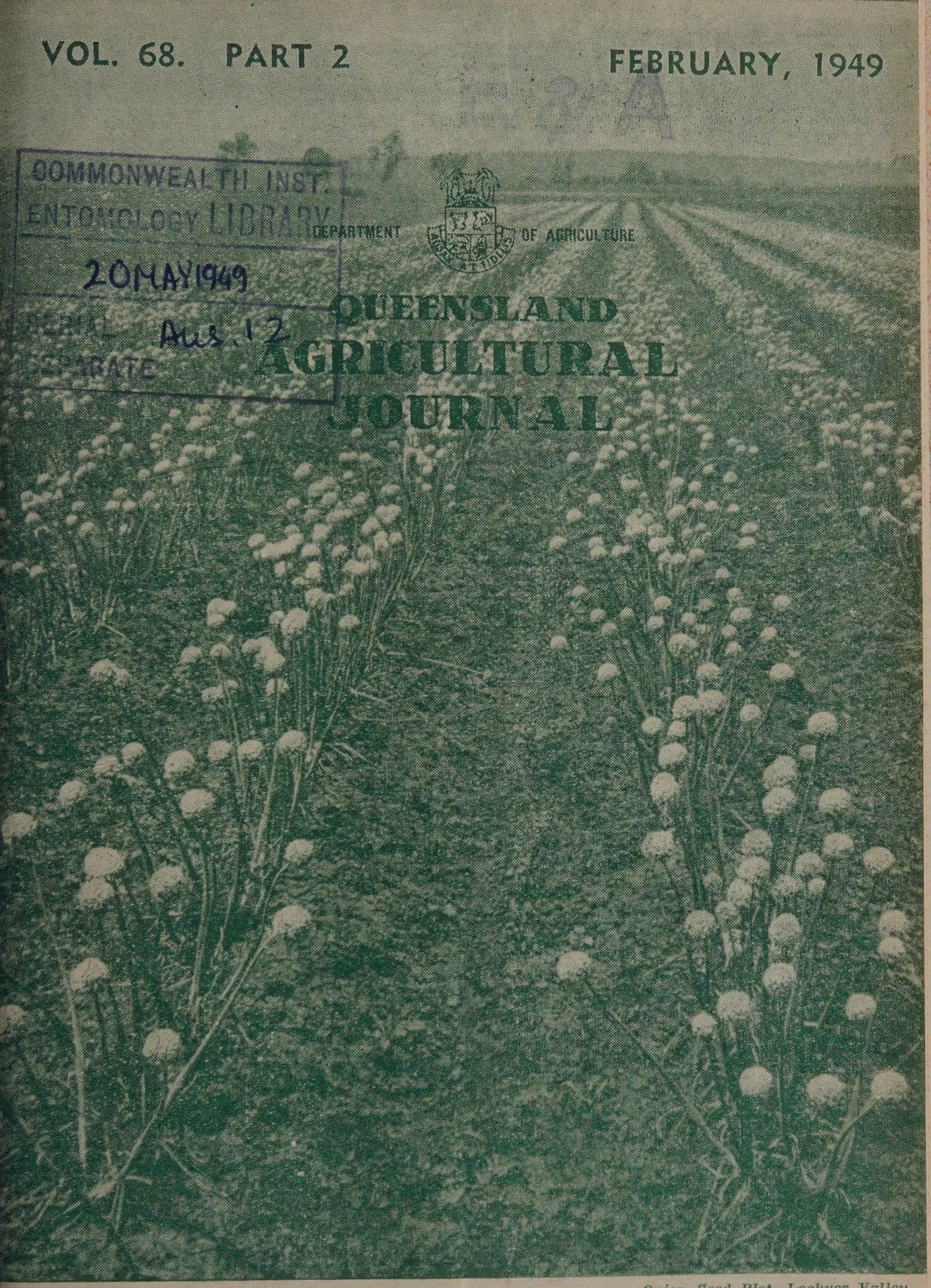

Onion Seed Plot, Lockyer Valley.

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Fodder Conservation in the United States
Subsoil Moisture for Callide Valley Wheat Crops
The Mango
Banana Rust Thrips Control Experiment
Estimation of Acidity in Milk, Cream and Whey
Fat Lamb Production
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C. W. WINDERS, B.Sc.Agr.

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Fodder Conservation in the United States.*

C. J. McKEON, Director of Agriculture.

FODDER conservation is practised on a very extensive scale in the United States, climatic conditions making this essential in most States where severe winters are experienced. It would be the exception to visit any farm on which livestock were kept and not find at least one large tower silo. These are filled each season chiefly with chaffed maize, which, as is the case in Queensland, is by far the most popular crop for ensiling. In addition to silage, large quantities of lucerne and cereal hay are produced and stored in bales.

For the harvesting of silage crops, ensilage harvesters are now used very extensively, these machines cutting and chaffing the crop and depositing it in a box wagon which is drawn beside the ensilage harvester while it is operating in the field. The chaffed material is transported from the field to the silos, where a blower is used to convey it into the silos.

Of the hay crops, lucerne is one of the most important and is grown over a large area in a number of different States and under a very wide range of climatic conditions. Every operation associated with the production of lucerne hay, from cutting to loading either the baled or the loose hay on the lorry, is done mechanically on a large proportion of farms. This makes it possible for individual growers to produce on a large scale and at a low cost.

Pick-up balers are now used very extensively and machines are being successfully operated in which wire is used for twitching in place of twine which was previously used. One of the early disadvantages of the wire twitch was that the twitch was too short, with the result that ties frequently came undone. This has now been overcome and the balers have been adjusted to make a much longer twitch. One machine I saw operating was turning out bales of approximately 65 lb. each at the rate of one every 10 seconds.

* These notes are explanatory of photographs taken by Mr. McKeon during a visit to the United States as a member of a committee investigating the soy bean industry.

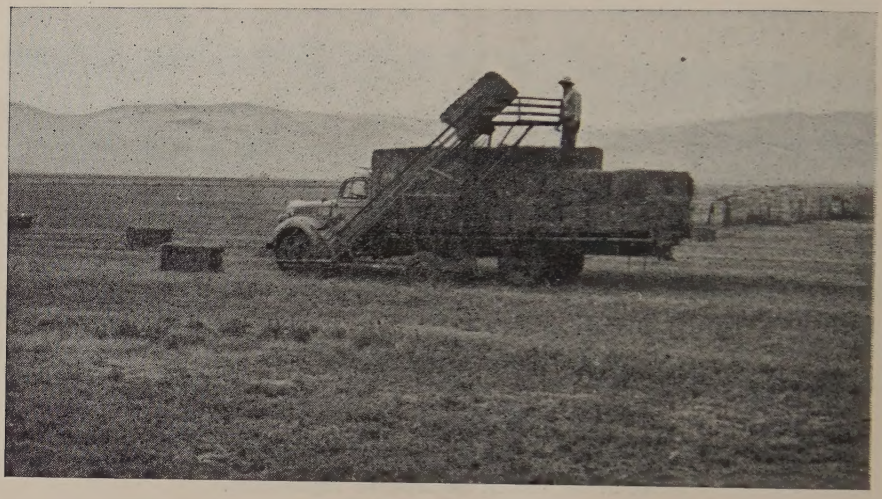

Plate 32.
A MECHANICAL BALE LOADER IN OPERATION.

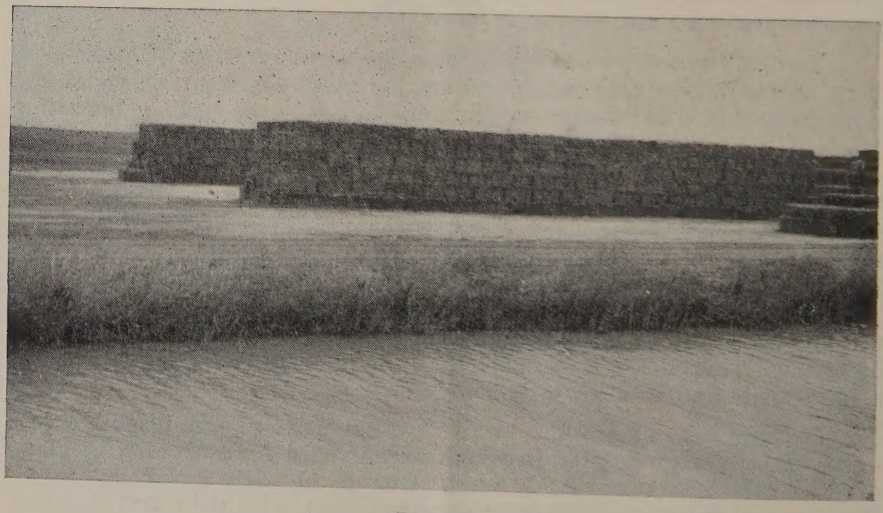

Plate 33.
STACKS OF BALED LUCERNE HAY.

Plate 34.

DEHYDRATION OF LUCERNE.—Cutting and windrowing the crop with a power mower with windrowing attachment.

Plate 35.

DEHYDRATION OF LUCERNE.—Lucerne being picked up from the windrow, chaffed and elevated into a box wagon.

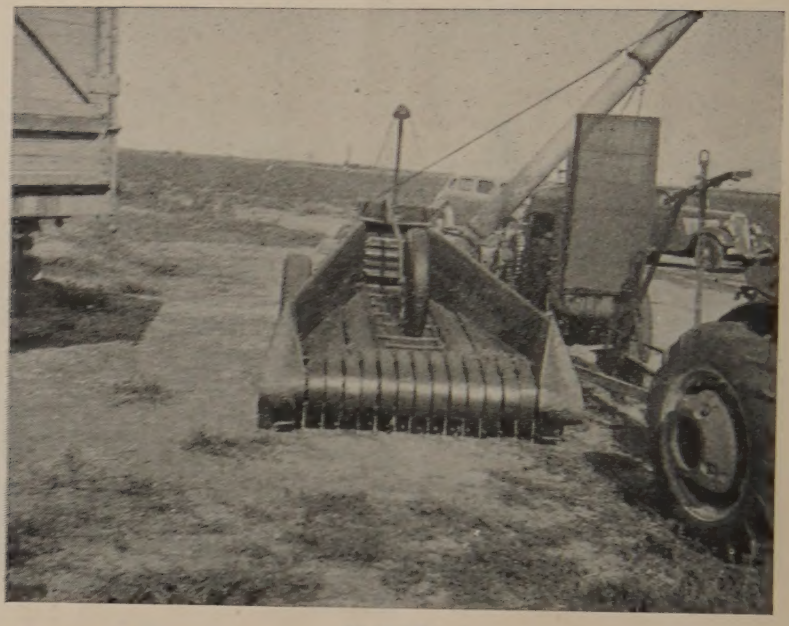

Plate 36.

DEHYDRATION OF LUCERNE.—Close-up of the lucerne chopper and elevator.

Plate 37.

DEHYDRATION OF LUCERNE.—Chopped lucerne being received at the dehydration plant.

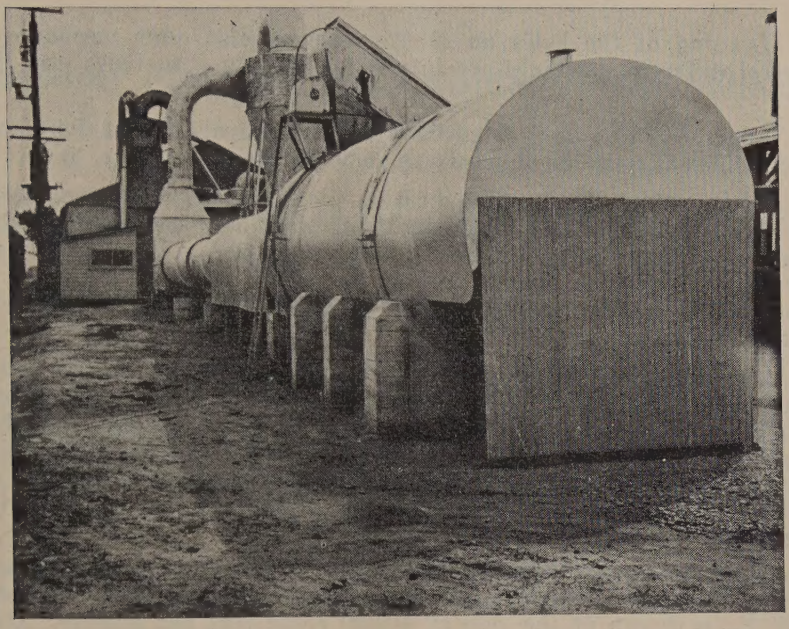

Plate 38.

Dehydration of Lucerne.—Portion of the dehydration plant, showing the first cylinder, in which the moisture content is reduced to about 25 per cent.

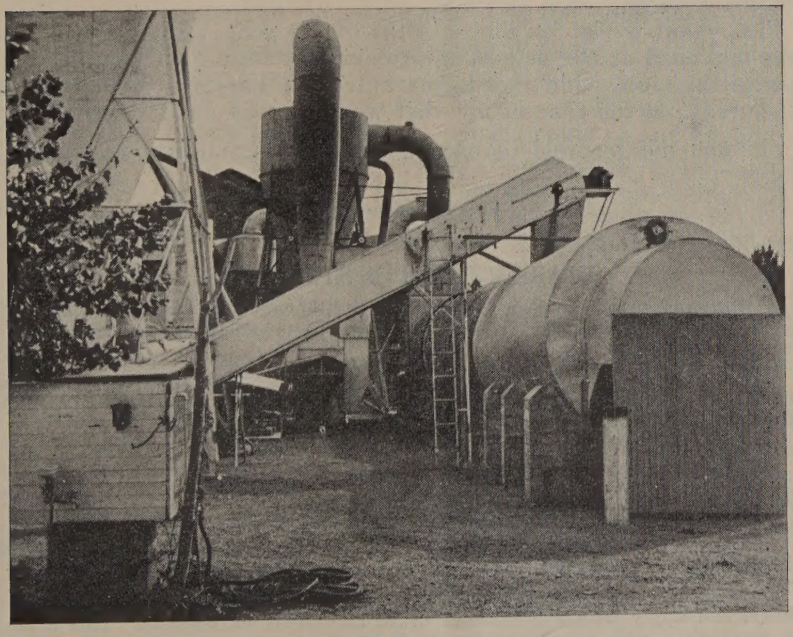

Plate 39.

Dehydration of Lucerne.—Portion of the dehydration plant, showing the second cylinder, in which the moisture content is reduced to about 10 per cent.

Loading of the bales on to the lorry is also done mechanically. Several different machines are in use for loading both bales and loose hay.

Lucerne is also used extensively for the preparation of dehydrated meal, which is quite an industry in some localities.

One particularly fine dehydration plant was seen in operation in the San Joaquin Valley, California. This plant had been installed about three years and was operated by 13 farmers, who received a flat rate per ton for the green lucerne and at the end of the year shared in the profits. The plant, which I was told cost 200,000 dollars, is claimed to be the largest ever built.

The lucerne is cut in the field with a power-driven mower with a windrowing attachment at the back of the knife blade. Immediately following the mower is a machine which picks up the cut lucerne, chaffs it and elevates it into a box wagon which is drawn beside the machine. The chaffed material is immediately taken to the dehydration plant and within eight minutes of its entering the plant is in the bag as a very fine meal.

The chaffed material is first passed through a cylinder, approximately 100 feet long and five feet in diameter, through which air heated to 1800°F., is drawn at the rate of 40,000 cubic feet per minute. Oil is used for heating. After passing through the first cylinder, the moisture content has been reduced to approximately 25 per cent. and the material is then elevated to a second tunnel of approximately half the length but at least twice the diameter, where the moisture is reduced to approximately 10 per cent. The dried material is passed through the hammer mill and bagged.

The plant works for nine months of the year, 24 hours a day, and turns out meal at the rate of approximately four tons per hour. The price of the meal, which has a guaranteed minimum protein content of 17 per cent., at the time of my visit was about 54 dollars a short ton.

It was not possible to obtain any figures relating to production costs.

WASHINGTON WHITEWASH.

A whitewash used overseas for painting lighthouses and other exposed buildings consists of three parts of cement and two parts of clean white sand mixed thoroughly with fresh water.

The wall should be wet and cleaned with fresh water, followed by the immediate application of the cement wash. This wash should be kept well stirred and should be as thick as can be conveniently applied with a whitewash brush.

A GOOD WHITEWASH.

Dissolve 2 lb. of ordinary glue in 7 pints of water. When dissolved add 6 oz. of bichromate of potassium, dissolved in a pint of hot water.

Stir the mixture well, add sufficient whitening to make it up to the usual consistency, and apply with a whitewash brush as quickly as possible. This dries in a very short time and, by the action of light, becomes converted into an insoluble waterproof substance which does not wash off even with hot water. It may be coloured to any desired shade by the use of a small amount of aniline dye or powdered colouring.

Subsoil Moisture for Callide Valley Wheat Crops.

R. W. GEORGE, Experimentalist, Biloela Regional Experiment Station.

IN view of the many excellent crops of wheat which were produced in the Callide Valley during 1948, it may be profitable to examine the probable reasons for such yields.

1948 Rainfall Conditions.

In most cases the wheat was planted either just after or just before the 3½ inches of rain which fell in mid-June. One-and-a-half inches of rain were received during the first week of July, but no further useful rain was recorded until after the crops had been harvested in the latter part of October and early November. This total of 5 inches of rain by itself would not have been sufficient for the growth of a successful wheat crop, even if run-off and evaporation losses were nil and all of the 5 inches of rain ultimately became available to the plants. Consequently, a considerable amount of moisture must have been already stored in the soil prior to the mid-June rain.

Flood rains occurred in early March and a further very useful rain group was recorded in late April and early May. Where ploughing operations were carried out by the middle of March a considerable portion of the moisture added to the soil by the flood rains remained stored in the soil. The 4½ inches of rain which fell in early May added considerably to the amount of moisture already stored in the soil, and the mid-June rain was also extremely useful in this connection.

On the basis of tests carried out at the Biloela Regional Experiment Station, at the end of June the average depth of soil containing moisture to field capacity was 3 feet 6 inches to 4 feet. As no useful rain fell from early July onwards, the moisture requirements of the wheat crop were met entirely by the moisture which was already present in the soil by the time the plants were a few inches high. Investigations made at this centre showed that all of the available moisture in the top 4 feet of soil had been utilised by the time the crop was approaching maturity with an average yield of 38 bushels per acre.

It is realised that the rainfall received during the March-June period of 1948 was considerably above average, but it must be remembered that severe drought conditions were experienced during January and February. One important feature of the rainfall received during March-June was that it occurred in rain groups of at least 3 inches at a time. Consequently, each successive rain group was able to thoroughly remoisten the surface layers of the soil and also to add some moisture to the subsoil zone. If this rain had been received in more scattered and lighter falls then the losses by evaporation before planting time would have been much higher.

Importance of Clean Fallowing.

Under the soil and climatic conditions of the experiment station, it has been demonstrated that in a clean fallow the loss of soil moisture by evaporation from below 8 inches is extremely slight even during a

fairly hot and dry six months' period. However, in the presence of any plant growth, either crops or weeds, any moisture reserve in the soil is quickly removed by the plants. Consequently, if soil moisture is to be successfully stored in the soil for a period of several months it is essential that all plant growth be kept at a minimum during that period.

An examination of the experiment station's rainfall records for July, August, and September reveals that in only a few years since operations were commenced there in 1924 would the rainfall received during these months have been sufficient to promote a satisfactory growth of a crop of wheat for grain purposes. The average rainfall for this three months' period is only 2.89 inches. During most of the seasons experienced at this centre, the amount of moisture which could be stored in the soil from January till June would be sufficient, however, for the successful growth of wheat crops. The average rainfall for this six months' period is approximately 17 inches.

Preparation of the Land.

Judged by the foregoing, it would appear that the successful growing of wheat in the Callide Valley depends upon the ability of the farmer to ensure that an adequate supply of moisture is stored in the soil by the time the crop is planted. The amount of rainfall received during the wet season, which is normally in January and February, is generally sufficient to wet the subsoil to a depth of at least 3 feet. If the land intended for wheat growing is ploughed as soon as possible after this late summer rain, most of that moisture will be retained in the soil. By ploughing immediately after the main wet period, it would be easier to control weed growth than if the land were ploughed early in January. For successful results, however, the land must be ploughed before the weeds are able to use much of the moisture which is added in the wet season.

In places where the risk of erosion during summer storms is only very slight it may be advantageous to plough the land during early January and then leave it in a rough condition till the end of the wet season. The maximum absorption of the heavy rains during this period would be effected by having the land in a very rough condition. In this connection, most soils in the Callide Valley do not require extensive and frequent cultivations to prepare a suitable seed-bed and too many cultivations cause a fairly rapid deterioration of the soil structure, with a subsequent loss of its absorptive qualities. Following the wet season the land could be given a shallow ploughing during March, using either a Sundercut or a standard plough. It should not be very difficult to control weed growth after this second ploughing. The essential point to keep in mind is that the maximum possible amount of the wet season and late summer rainfall must be retained in the soil, and this can only be achieved if plant growth is subsequently kept fairly well in check.

Early Varieties Desirable.

Many of the standard Queensland wheat varieties have yielded quite well under Biloela conditions, but in most seasons the earlier maturing varieties give better results than the later maturing ones.

The Mango.

S. E. STEPHENS, Horticulturist, Horticulture Branch.

IN point of antiquity the mango rivals most other fruits, and it appears to have occupied the same relative position in the culture of the tropical oriental regions as the vine and apple have in the more temperate lands. De Candolle, a famous botanist of the eighteenth and nineteenth centuries, who studied the subject closely, expressed the opinion that its cultivation extends over a period of 4,000 years or more; its relationship to Hindu religion and mythology certainly indicates great antiquity.

In historical times, references in literature to the mango have been frequent. It must have been a common tropical fruit from the earliest times of the Christian era as it has been remarked upon by many travellers, both ancient and modern. Its antiquity is so great and its cultivation so widespread that its origin is rather shrouded in mystery. De Candolle was satisfied that south-eastern Asia (and possibly southern India) is the natural habitat.

BOTANY.

The tree belongs to the family *Anacardiaceae* and consequently is related to the tar tree and the cashew. In common with its relatives, it possesses a caustic sap; the evidence of this is visible on children during the early part of the mango fruiting season when mango sores, caused by contact with the sap of immature fruit, develop on exposed parts of the skin. The generic name is *Mangifera* and the specific name of the commonly cultivated tree is *indica*. Altogether some 40 species of *Mangifera* are recognised by botanists, the majority occurring in south-eastern Asia.

Races and Varieties.

Over many centuries the mango has been very largely propagated from seed, and, owing to a peculiarity of the seed, certain types have perpetuated their characters from generation to generation with but little change. These have become known as races. From time to time an outstanding tree in one or other of these races has been propagated by budding, grafting or inarching and has then become a horticultural variety of the race.

In some countries vegetative methods of propagation have been followed so long that the original races have been almost lost to sight. This is not the case in Queensland, however, where propagation is almost entirely from seed. Consequently, several races may be clearly recognized. Of these, the most widely grown is the one known as the "Common" mango. It is cultivated along the whole of the eastern coast and exhibits uniform racial characters throughout. The tree has usually an oval head; the foliage is dense and the leaves of medium size. The fruit is long, always yellow-green in colour, has an elevated stem attachment and is thin-skinned and very fibrous but sweet and well flavoured.

A second race, well known but by no means so commonly grown, is the "Peach" mango. This has a shorter fruit than the Common, with the stem set in a depression, the skin highly and attractively coloured, the flesh fibrous and the flavour turpentine.

A third race now becoming very widely grown is what is often called the "Apple" mango, but which on the market is known as the "Kensington" or "Bowen" variety. The following is a brief description of the tree and fruit of this variety:—Tree shape, oval. Leaves with a characteristic sweet scent when crushed. Fruit weight about 15 ounces, size $4\frac{1}{2} \times 3\frac{3}{4} \times 3\frac{1}{4}$ inches. Skin of fine texture, bright orange-yellow with red-pink blush over base and exposed faces of the fruit. The stem is in a slight depression and the fruit is grooved ventrally from stem to the prominent nak. When young the apex of the fruit is distinctly wedge-shaped when viewed from the side, while from the face it has a prominently-squared beak. As the fruit matures the apex fills out and rounds off and the beak becomes less pronounced. Flesh of the ripe fruit is thick, of rich orange colour, free of fibre, and of rich, pleasant flavour. It is a mid-season variety.

Other races of minor importance exist in Queensland but they do not warrant enumeration.

Overseas countries recognize races of their own as well as imported races, such as West Indian, Alphonse, Cambodiana, Mulgoba and Sandersha, but the common Queensland races are not referable to any or these.

Description of the Tree.

The mango tree is evergreen and densely foliaged and possesses few rivals as a shade tree. Growth of the tree is vigorous and a mature seedling may reach a height of 50 or 60 feet with a branch spread of about the same and a trunk girth of 10 to 15 feet. Odd trees exceed even these measurements, which, for a fruit tree, are large, and W. Popenoe, an American authority on tropical fruits, reports a specimen in Brazil having a branch spread of 125 feet and a trunk girth of 25 feet.

Trees vary somewhat in shape, particularly in the case of seedlings, but usually those of the same seedling race have similar growth habits. Some races are tall, upright growing and narrow (Plate 40), others have a round or oval head (Plate 41), and others again have a broad base and a tapering, pyramidal top (Plate 42).

The leaves are simple and entire, often up to 15 inches long and seldom more than $2\frac{1}{2}$ to 3 inches wide. They are borne on the branchlets in large numbers. Flowers are borne in large terminal panicles containing possibly several thousand flowers in all, but seldom more than two or three mature fruits result from the flowers on each panicle.

Plate 41.
A Round-headed Mango Tree.

Plate 40.
Mango Tree of Tall Habit.

Plate 42.
PEAR-SHAPED MANGO TREE.

Description of the Fruit.

Fruits vary considerably in size, shape, colour, fibre and flavour just as do varieties of apple, pear and many other fruits. They possess several general characters, however, that differentiate them from other fruits, and since it is upon these characters that the varieties are distinguished it is necessary to become familiar with the terminology relating to mango fruit. Plate 43 shows the outline of two typical mango fruits with the features marked. It will be observed that a mango is always described with the "nak" or stigmatic point facing the left.

The fruit does not develop symmetrically about the stem, hence the various features that are delineated in Plate 43. The stigma is not situated at the apex but always to the ventral or left side and at various distances from the apex according to the variety. The ventral shoulder always develops to a greater extent than the dorsal shoulder, but below the shoulders the ventral side is usually concave whilst the dorsal side is strongly convex. The distance between the dorsal and ventral shoulders is known as the major diameter and the line through the fruit at right angles to this (not shown in the sketch) is the minor diameter. The base of the fruit may be depressed when the stem is set in a saucer-like depression, or it may be elevated when the stem is set on a raised attachment.

Fruit colour is an extremely variable factor. The basic variation between varieties or races is often very great, for whereas some kinds retain a uniform yellow-green colour when ripe, others are a rich orange colour, others straw coloured, others again a uniform deep red, while yet others display a combination of two or more of these colours. These are the general varietal or basic colourations but environmental factors will also bring about variations in the colouration of fruit within a variety.

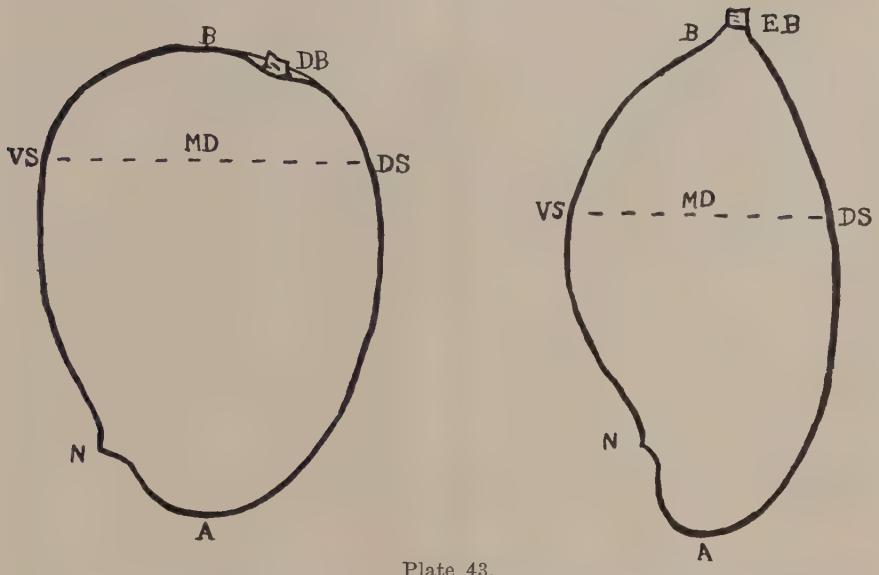

Plate 43.

The Features of a Mango Fruit.—A—Apex; B—Base; DB—Depressed base; EB—Elevated base; N—Nak; VS—Ventral shoulder; DS—Dorsal shoulder; MD—Major diameter.

Plate 44.

Degrees of Fibrousness in Four Typical Mango Varieties.—A and B, unnamed varieties under trial; C, Kensington; D, Common fibrous type.

Flavour is almost as variable as colour but it remains constant for any variety under any given conditions. It varies from insipidly sweet and fragrant at one extreme to strongly acid and odoriferous at the other, and includes in the less desirable range fruits of varying degrees of turpentine flavour and odour. On the other hand, many races and varieties possess a sugar-acid ratio and a bouquet that make them highly desirable fruit and justly popular.

Fibre content is an important feature in the mango. It completely outweighs flavour, since when fibre content is high, it reduces even the best flavoured fruit to an unmanageable problem at the meal table. Fibrousness is a condition of the seed, and as the length and number of fibres on the seed increase the suitability of the fruit for eating purposes decreases. Complete absence of fibre is the most desirable condition for edibility, but a fruit lacking all fibre would be of poor carrying quality and hence of indifferent market value. Plate 44 shows the amount of fibre in fruit of four different varieties, A and B being two North Queensland varieties under trial by the Department of Agriculture and Stock, C the Kensington widely grown in the Bowen district for market sale, and D a common fibrous type.

Growth Habits.

A mango tree makes several bursts of growth during the year, each of these (known as a "flush") taking place from the terminal of the previous growth. The young shoots are very tender growth, and are usually either red or yellow in colour. After shoot elongation is complete, and the leaves have attained mature size, the colour changes to normal green. The period of flush growth extends over three or four weeks and is followed by a period of inactivity before the commencement of the next flush. The flushes do not seem to occur at any fixed periods. In fact, it is quite common for flush growth to occur very unevenly on a tree, some branches being in active growth while others are dormant.

Mango trees are seldom completely dormant, but immediately following the harvesting of the crop a period of some weeks of reduced growth usually occurs.

Tree Growth and Flowering Relationship.

It has been observed by a number of investigators that mango flowers are produced only on one-year-old wood, and mainly on the wood shoots that grew in the early part of the season. Shoots that are produced later in the year either do not flower at all or produce only weak flowers that fail to set any fruit. If a tree produces a large amount of wood growth late in the season—that is, shortly before the flowering period—then such a tree will produce very few flowers that season. It follows that weather conditions which favour early growth, and an early cessation of growth, are needed for good cropping.

Providing the normal cycle is not upset by disease or pests or by abnormal weather conditions, it should be possible to forecast with some degree of reliability the likely amount of flowering in the approaching season.

It has also been observed that fruit production is always at the expense of vegetative growth. A shoot that sets and matures a fruit will not produce a vegetative shoot in the same season, but one which

flowers and fails to set any fruit will often produce a vegetative shoot later in the season. Consequently, if a tree was to carry a fruit on every shoot (which, of course, does not occur), it would make no new vegetative growth that year and would have no fruit the following year.

It is not possible to determine, before the terminal buds commence to swell, which will be flower buds and which vegetative or wood buds. However, external differentiation is noticeable within a short time of bud movement. The characters that distinguish the two types of bud are illustrated in Plate 45. The flower bud develops a distinct beak, whereas the wood bud remains slender and straight.

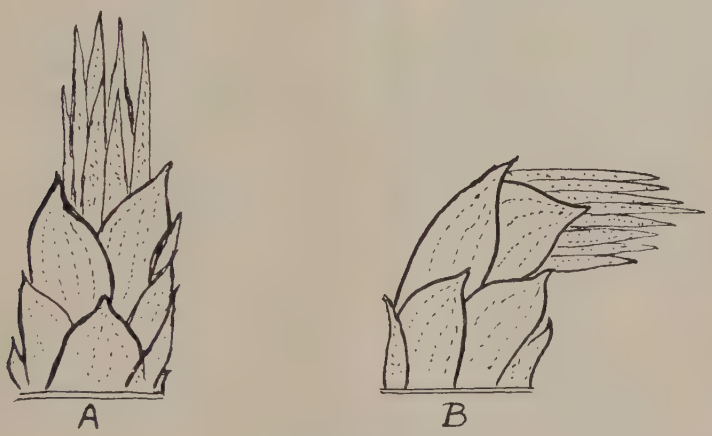

Plate 45.

Bud Differentiation at Earliest Stage of Growth Flush.—Fig. A.—Initial growth of a vegatative shoot bud. Fig. B.—The same growth stage of a floral shoot bud.

Flowers.

Flowers in the mango are produced in the form known as a panicle; and a panicle may carry as many as 3,000 to 4,000 flowers or as few as 200 to 300. The form of panicle may vary considerably in different varieties. Sometimes the central axis is short and the primary laterals short and stiff; on other varieties the main axis may be as long as 20 to 24 inches and the primary laterals also long and drooping. The longest laterals are always grouped round the base of the axis; as the apex is approached they become progressively shorter. The flowers customarily mature progressively from the base to the apex of the panicle.

The individual flowers are small—about one quarter-inch in diameter. They are either staminate (male) or perfect (bisexual). As a rule, most are staminate, the percentage sometimes being as high as 98, but in some varieties the perfect flowers may be almost as numerous as the staminate. The perfect flowers are distinguished by the presence of a small globose ovary surmounting the disc located in the centre of the corolla. In the male flowers the disc is present but the ovary is wanting.

Pollination and Fruit Setting.

Flowers are scented and also produce nectar; consequently they are attractive to insects, indicating that the tree is insect pollinated. The honey bee is not a frequent visitor to mango flowers so plays a very minor part in the pollination of this fruit. The chief visitors, in order of frequency, are flies of many kinds, wasps, butterflies and beetles. Notwithstanding the numerous insect visitors, the percentage of effective pollinations is low. In most varieties grown in Queensland the number is seldom more than two on a panicle; more frequently it is only one.

It is common for the perfect flowers to outlive the staminate, and the ovary may even commence to swell but effective pollination may not have occurred and the flowers eventually wither and fall.

Fruit setting is more frequent near the apex of the flower panicle than on the primary laterals near its base. This accounts for the elongate stem upon which mango fruits are usually borne.

Seed Characteristics—Monoembryony and Polyembryony.

Reference has been made above to the peculiarity of the seed of some mangoes. This condition is known as polyembryony.

The great majority of horticultural plants produce but one seedling from each seed, this being the result of the union of a sperm and ovule, and hence a sexual cross. Such seeds contain but one embryo and are termed monoembryonic. In the production of this seed, pollination may have been effected within the one flower, when the seedling tree will be similar to the parent; alternatively, different flowers, possibly from different trees, may be involved in the pollination, in which case the seedling is likely to exhibit marked differences from the parents. This applies particularly to many of the choice Indian varieties. Thus these good varieties could not be depended upon to reproduce themselves and Indian gardeners found it necessary to develop the vegetative propagation method known as inarching.

Polyembryony is a characteristic of the seedling races of Queensland, the Philippines, Cambodia and other places. A polyembryonic mango produces several plants from each seed, due to the habit of buds being produced on the seeds in the same way as on the branches. A shoot from a seed bud, being vegetative growth, is identical in race characters with a shoot from a branch bud of the same tree.

It is necessary, of course, for flowers of polyembryonic mango trees to be pollinated to obtain fruit setting; consequently, the seeds also contain the germ of a sexual cross. However, in most cases the growth of this embryo is suppressed by the development of the vegetative buds. Occasionally it does grow and develop into a seedling; should that occur, the seedling cannot always be differentiated from the vegetative plants. When such a plant is set in the field with the others it will, in the course of time, exhibit more or less variation from the racial type either in tree growth or in fruit characters, or in both. The tree has foreign characters in its make-up, due to the sexual cross, and consequently is "off type."

Plate 46 illustrates the vegetative growth that results from monoembryonic and Plate 47 that from polyembryonic seeds.

Plate 46.
Growth from a Monoembryonic Mango Seed.

Plate 47.
Growth from a Polyembryonic Mango Seed.

Rooting Habits.

In the early seedling stage of growth, tap root development is the main feature of the root system, elongation of the tap root exceeding aerial growth of the plant. In later life the emphasis on deep root growth continues, anchor roots being thrown down at frequent intervals from the surface rooting system. Such roots extend to many feet in depth. In the Bowen district the evidence of tree growth appears to point to the deep roots descending to at least 18 feet. This is based on the fact that trees during their early years are pale and sparse in foliage due to shortage of soil moisture, but, after they have reached

Plate 48.

Mango Tree with Portion of Root System Exposed Showing the Profuse Rooting Habit.

the age of five or six years with corresponding increase in size, the foliage becomes dense and dark green, apparently indicating that the roots have reached the water table which in that district is situated at about 18 feet.

In addition to the anchor roots, the trees have a dense network of roots extending widely through the surface soil. Plate 48 illustrates part of the rooting system of a mango tree. Due to the erosion of a bank upon which this particular tree was growing, approximately half the root system to a depth of about 10 feet was clearly exposed. The ramifications of root development are well illustrated.

CLIMATIC REQUIREMENTS.

The mango is a tropical species and it is only well within the tropics that it may be found growing naturally in competition with the native flora. Such a condition exists in many parts of the coastal

area of North Queensland. However, under conditions of garden care or orchard culture the tree can be grown quite successfully in the sub-tropical region of southern Queensland and in the highland parts of North Queensland. It is not frost hardy, so should not be planted where it would be regularly subjected to freezing temperatures. In places that may experience light frost of one or two degrees at long intervals the tree usually can be established by giving it protection during the early years of its growth. When mature, it can more successfully withstand a few light ground frosts. However, where freezing temperatures are experienced with more or less regularity it is useless to attempt to grow the tree, since the young wood, upon which the fruit is produced, would be regularly destroyed.

There is no critical maximum temperature for the mango; it thrives under the hottest conditions.

Rainfall, particularly in respect to its seasonal incidence, is as important in fruit production as temperature is in tree growth. The amount of annual precipitation may vary between wide limits without adversely affecting cropping. In North Queensland, the Bowen district, with an average annual rainfall of approximately 30 inches, and the Cairns district, with an average of approximately 90 inches, both produce heavy mango crops. In both these districts the rain falls during the early months of the year and the months between July and November are practically dry. This dry season coincides with the main flowering and early fruit growth, and regular cropping and good quality fruit result.

At Innisfail, annual rainfall is approximately 140 inches. Although the greater part of this precipitation is experienced during the first half of the year, a considerable number of showery days occurs during the later months. Under these conditions tree growth is vigorous but flowering is irregular and the incidence of disease on the flowers and fruit is high.

At Townsville, with approximately the same rainfall as Bowen, a variation in mango cropping is introduced. Throughout North Queensland there is a regular early flowering which precedes the main flowering by two to three months. In many parts this flowering is destroyed by fungus infection, following rain or heavy dews, but at Townsville neither rainfall nor dew occurs at this time so an early fruit setting is obtained in addition to the normal crop.

Dry weather during flowering and early fruit growth are of the utmost importance.

SOIL REQUIREMENTS.

The mango is extremely adaptable in the matter of soil. In Queensland it may be found thriving on soils derived from decomposed granite, basalt and schists, and on alluvials and beach sands. Good drainage is the most important feature and it should be coupled with a stable water table. The depth of the water table is not of vital importance provided it does not fluctuate between wide limits in any location and provided it is not in the surface soil range. The tree forages widely and deeply where the soil is of suitable texture and well drained, and it is this habit that makes it so adaptable.

[TO BE CONTINUED.]

PLANT PROTECTION

Banana Rust Thrips Control Experiment, 1948.

J. HAROLD SMITH, Assistant Director of Horticulture,*
and J. A. WEDDELL, Entomologist, Science Branch.

IN 1946-47, an experiment at Beenleigh demonstrated that, in a moderate outbreak of the banana rust thrips†, the pest could be controlled by applying a 2 per cent. DDT dust to the bunches at fortnightly intervals during the growing period. The work also indicated that bunch protection for a period of eight weeks would be adequate in commercial practice.

More recent work carried out in the 1947-48 season was both demonstrational and experimental in character. It was intended to demonstrate the benefits to be derived from using 2 per cent. DDT dust and at the same time to compare other methods of treatment. The plots were located in plantations at four different centres and the insecticidal treatments were applied mainly by field officers of the Horticulture Branch without whose assistance the project could not have been carried through.

Experimental Plan and Method.

Three different insecticides were compared and some bunches were left untreated to serve as checks. The treatments referred to were as follows:—

2 per cent. DDT dust;

4 per cent. BHC dust;

1 per cent. DDT and 1·5 per cent. BHC combined dust.

The insecticides were applied first when the bunch was thrown and thereafter at fortnightly intervals for a period of six weeks. Each bunch that was thrown in a plot requiring treatment with an insecticide thus received four applications. Thereafter it was given no further attention until it was approaching commercial maturity, when the final assessment of rust incidence was made. The plots were established during the first week of January, 1948, and all bunches thrown between that time and the end of March received the appropriate applications.

The experiment was divided into eight replicates and in each replicate approximately 50 bunches were treated with each insecticide, a similar number being left untreated. Two of these replicates were

* Formerly Senior Entomologist, Science Branch.

† *Scirtothrips signipennis* Bagn.

placed at each of four centres—Golden Valley (via West Burleigh), Beenleigh, Palmwoods and Gympie. Thus the total experiment involved approximately 1,600 stools of bananas. The conditions at each centre were as follows:—

Golden Valley.—First-cut Cavendish and Mons Marie bananas, on a north-westerly slope. Thrips moderately active in January.

Beenleigh.—First-cut Mons Marie bananas on a north-easterly slope. Thrips moderately active in January.

Palmwoods.—First cut Cavendish bananas on a northerly slope. Thrips fairly light in January, developing rapidly in intensity.

Gympie.—First-cut and second-cut bananas of mixed varieties, viz., Cavendish, Mons Marie and Sugar, on a north-westerly slope.

Generally speaking, throughout the experimental areas the banana rust thrips was the only fruit pest of any consequence. Some damage due to fruit-eating caterpillars* was found and although this was of minor importance observations on the effects of the insecticides on these insects were nevertheless possible.

In addition, at the Golden Valley and Beenleigh plantations a number of bunches outside the experimental plots were covered with hessian when thrown and were given two applications of 2 per cent. DDT dust, the first immediately prior to covering and the second a fortnight later under the covers.

Method of Assessing Results.

As in previously conducted banana rust thrips control experiments the method of assessing results was by allotting values or ratings to the fruit as it approached maturity, the value 0 being given to unblemished fruit and the value 3 being given to fruit showing maximum injury. On this occasion the experiment was distributed in four widely spaced districts. Hence a common standard for maximum injury rating could not be adopted and the standard in each centre was the condition of the worst top hand present in the plots that received no treatment. By this means the relative values of the different treatments could be fairly assessed. So as to prevent the possibility of fruit reaching maturity and having to be harvested by the growers in the absence of the experimenters, it was decided that the assessments would take place at standard times after the inception of the work, depending on the time the bunches were thrown, according to the following table:—

Bunches thrown.	Injury assessed.
During first 4 weeks ..	12 weeks after inception
During 5th to 8th week ..	16 weeks after inception
During 9th to 12th week ..	20 weeks after inception

* *Heliothis armigera* Hb. (mainly).

Results.

Of the insecticides used, the 4 per cent. BHC dust gave consistently the best results in banana thrips control although the other two—that is, the 2 per cent. DDT dust, and the 1 per cent. DDT and 1·5 per cent. BHC combined dust—were nevertheless quite satisfactory. Earlier mention was made of the presence of some fruit-eating caterpillars. The principal species in this instance was the corn ear worm; an Oecophorid was also present but it occurred in the bracts and was not injurious to the fruit. The former species caused some damage to bunches in the plots treated with BHC and in the untreated plots. In the plots which received DDT, either alone or in combination with BHC, fruit injury from that cause was absent.

The superiority of BHC over DDT from the point of view of thrips control is doubtless due to its fumigant properties which may contribute something to the more effective eradication of the insects from the relatively protected top hands, a matter that is discussed later. For the time being, however, DDT is still the obvious choice, for it has not the objectionable smell of BHC, and while giving good thrips control it is effective against fruit-eating caterpillars.

Discussion.

1. *Effect of location on rust incidence.*—In the season under discussion the heaviest rust occurred in the Palmwoods plantation, which has a northerly slope. The attack was moderately severe during the three-month period from January to March. At Beenleigh and Gympie the outbreak reached its peak in February and tapered off rather sharply during the following month.

2. *Effect of variety on rust incidence.*—The fruits of the Cavendish variety are tightly pressed together when the bunches are thrown. In Mons Marie, the fruits are initially well spaced and close up two or three weeks later. Equal thrips populations would therefore be expected to cause more damage to the variety Cavendish than to Mons Marie, as the insect prefers the shelter provided by closely packed fruit. This feature was noticed where untreated bunches of each variety were compared. Again, as the upper hand is the most difficult on which to apply an insecticide, contains the best fruit, and is the most susceptible to rust, Mons Marie would appear to be the better variety to grow in areas susceptible to rust. Mons Marie is, however, a tall variety and proper treatment is far from easy. Thorough coverage with the insecticide is essential when thrips are active, and the accessibility of bunches in the dwarf types of Cavendish may offset the apparent advantages of the taller Mons Marie.

3. *The operator and control efficiency.*—Each plantation was serviced by a different operator and there were inevitable differences in the dusting technique. It was noticeable that to some extent these differences were reflected in the final results, without at the same time affecting the validity of comparisons between treatments. It was, however, demonstrated that the dust application, though light, should be thorough and even.

4. *Rust incidence and plant age.*—It is normally considered that the "plant" crop is most susceptible to rust. The data from Gympie suggest that, under some circumstances, second-cut bunches are as susceptible to attack by thrips as first-cut bunches. Insecticidal control

may, in addition, be more difficult in second-cut bunches owing to (*a*) the greater difficulty of treatment (unless a one-bunch one-sucker programme is used), and (*b*) the increasing proportion of compacted top hands in all but well-managed plantations growing in fertile soil.

5. *The role of bunch covers.*—Thrips control recommendations prior to the advent of DDT required the use of a nicotine dust under hessian covers. More recently covers have been used to a greater extent in order to improve fruit quality, irrespective of possible thrips infestation, particularly in bunches thrown from March onwards. Covers, however, may have some value in summer in promoting an even filling of the fruit in all parts of the bunch.

The results obtained from the use of DDT under bunch covers in the subsidiary treatment mentioned earlier were quite good so far as thrips control is concerned, though somewhat inferior to uncovered bunches receiving the normal insecticidal treatment. This may be a disability inherent in the use of a dust, such as DDT, with a non-fumigant effect, when applied under covers. Little dust can be expected to reach the upper hands where it is most needed. Dust containing BHC would probably be more effective under such conditions.

In view of the known effectiveness of DDT and BHC when used without covers, the summer use of covers should be recommended only because of their possible contribution to fruit quality. If covers are to be used and thrips control measures are also needed, then the two can be combined satisfactorily. A suitable method would be to delay the placing of the covers until after the second application of the insecticide.

Conclusions.

1. A 2 per cent. DDT dust, a 4 per cent. BHC dust and a dust containing 1 per cent. DDT and 1·5 per cent. BHC all gave good control of the banana rust thrips in moderately severe outbreaks at Golden Valley (via West Burleigh), Beenleigh, Palmwoods and Gympie when applied four times at fortnightly intervals from the time the bunch was thrown.

2. The 4 per cent. BHC dust was rather more effective than the 2 per cent. DDT dust against banana rust thrips, particularly when it was difficult to get complete coverage, as for instance in the top hands shortly after the bunch was thrown. The insecticide is, however, objectionable to use.

3. DDT is a general purpose dust which controls both banana rust thrips and certain fruit-eating caterpillars. BHC may allow fruit-eating caterpillars to develop normally.

4. Thorough bunch treatment is essential when insecticides are used to control banana rust thrips. Particular care needs to be taken in the case of the less accessible bunches of the taller varieties.

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Estimation of Acidity in Milk, Cream and Whey.

Prepared in the Division of Dairying.

THE regulations under the Dairy Produce Acts specify that no milk containing more than 0·25 per cent. nor cream containing more than 0·67 per cent. of acidity shall be classified as first-grade quality. The development of acidity in milk and whey is all-important in cheesemaking and accurate control of cream acidity plays a very large part in the manufacture of a good quality butter.

For these reasons it is essential that accurate acidity tests be performed at all times. Attention to details and a knowledge of the principles involved in the estimation are as necessary to the factory operative as they are to the analyst.

Reagents.

1. *Decinormal sodium hydroxide,* also known as tenth normal or N/10 alkali.

2. *Phenolphthalein* indicator solution.

Apparatus.

1. *Burette,* graduated in 0·1 ml. divisions.

2. *Burette stand* and *clamp.*

3. *Pipette,* may be of any desired capacity. Usually a 9 ml., 10 ml., 17·6 ml., or 20 ml. pipette is used.

4. *Titration vessel.*

5. *Glass stirring rod.*

Determination.

(a) *Milk and Whey.*—By means of the pipette measure out a known volume of milk or whey, wiping the outside of the pipette *before* adjusting the bottom of the meniscus to the graduation mark.

Transfer to the titration vessel. Add 5 to 10 drops of phenolphthalein solution. From the burette run in the decinormal sodium hydroxide solution drop by drop, stirring the contents of the vessel constantly. Stop when the first tinge of pink colour appears. Read off the volume of decinormal alkali solution used.

$$\text{Percentage of acidity} = \frac{\text{ml. of N/10 alkali used x 0·009 x 100}}{\text{quantity of sample taken.}}$$

(b) *Cream.*—By means of the pipette measure a known volume of cream, wiping the outside of the pipette *before* adjusting the bottom of the meniscus to the graduation mark.

Transfer to the titration vessel. Rinse out the pipette with warm distilled or rain water by filling approximately to the position of the graduation mark and add the rinsings to the contents of the titration vessel. Add five to ten drops of phenolphthalein solution and proceed as directed for milk and whey.

Acidity.

When milk is freshly drawn from the udder it has an acidity ranging from 0·1 to 0·2 per cent., in some cases even higher, the average being about 0·17 per cent.

This initial acidity is due to acid salts, casein, and dissolved carbon dioxide. On exposure to the air some of the carbon dioxide escapes and the acidity drops a little. It soon begins to rise again owing to the action of bacteria which act upon the lactose, forming lactic acid. There are thus two forms of acidity in milk, the initial acidity due to normal milk constituents and that due to lactic acid.

As it is difficult to differentiate between the lactic acid and other acidity, the whole acidity is for convenience calculated and reported as percentage of lactic acid.

Principle of the Test.

When an acid is mixed with an alkali a chemical reaction occurs with the formation of a neutral substance, termed a salt, and water. This reaction is known as neutralization. Thus when lactic acid and sodium hydroxide react, neutralization occurs with the formation of sodium lactate and water.

$$\underset{\text{Lactic acid}}{C_3H_6O_3} + \underset{\substack{\text{Sodium}\\\text{hydroxide}}}{NaOH} \longrightarrow \underset{\text{Sodium lactate}}{C_3H_5O_3Na} + \underset{\text{Water}}{H_2O}.$$

As this is a reaction between definite chemical compounds, it is a comparatively simple matter to estimate the percentage of lactic acid when a known amount of milk or cream is initially taken and neutralized with a sodium hydroxide solution of known strength. The neutralization must not be overdone, however, and a substance known as an indicator is used to show when the neutralization is complete. Indicators are substances which display a marked colour change in acid and alkaline solutions. Phenolphthalein, for example, is colourless when acid and red when alkaline, and has been found to be the most suitable indicator for the particular purpose under discussion.

Calculation of Percentage.

From the equation shown above it has been calculated that 90 parts by weight of lactic acid will be neutralized by 40 parts by weight of sodium hydroxide. The decinormal sodium hydroxide is made to a

definite strength and contains 4 grams per litre. Thus 1 ml. (one thousandth of a litre) contains 0·004 gram of sodium hydroxide. It is just a matter of simple proportion to determine that 1 ml. of decinormal sodium hydroxide solution will neutralize 0·009 gram of lactic acid.

When a known quantity of milk or cream is taken and the acidity is neutralised by a determined volume of decinormal sodium hydroxide, the percentage of acidity may thus be determined:—

$$\text{Acidity percentage} = \frac{\text{ml. of N/10 alkali used x 0·009 x 100}}{\text{quantity of milk or cream used}}$$

This equation may be used when any known quantity of milk or cream is taken. Applying it to the widely used 9 ml. pipette the equation becomes

$$\text{*Acidity percentage} = \frac{\text{ml. of N/10 alkali used x 0·009 x 100}}{9}$$

$$= \frac{\text{ml. of N/10 alkali used}}{10}$$

When any other volume of milk or cream is taken the full equation must be used.

Precautions to be Observed.

1. *The sample taken for examination must be representative of the bulk.*—This is so obvious that a detailed discussion is unnecessary. Care must therefore be taken to mix thoroughly the contents of the vat or other container, and then to take a number of small samples from different places, and thoroughly mix these small samples together.

2. *Location of Equipment.*—The tests should be performed in a well lighted position but not in direct sunlight. It should, of course, be close to the neutralizing vats in a butter factory and to the cheese vats in a cheese factory. It has sometimes been noticed that the equipment is placed in a small cupboard or dark corner of a factory where accurate tests are impossible. It is such an essential part of factory routine that provision should be made for this equipment when the factory is being designed.

3. *Accuracy of the Graduated Glassware.*—Of those pipettes likely to be used in acidity tests, specifications are provided in the Dairy Produce Acts for the usual 9 ml. pipettes and for the 17·6 ml. pipettes which can also be used. Although alternative sizes can be used, the operator is advised to use one of these two if at all practicable. These two pipettes are required to be certified as to their accuracy, and none other than those officially stamped by the Department of Agriculture and Stock should be used.

Pipettes of other capacities and also burettes do not need to conform to Departmental specifications, and the best precaution here is to purchase from only reputable firms.

4. *The Titration Vessel.*—The ideal titration vessel is a shallow white cup or basin with translucent walls. This is hardly necessary for ordinary work, for which a shallow wide-mouthed cup will be found

* Strictly speaking this only gives the percentage by volume, i.e., 100 volumes of milk or cream contain so many parts by weight of lactic acid. The figure so obtained is, however, close enough for most practical purposes.

satisfactory. A metal vessel, such as is used in butter factories for collecting cream samples, is very unsatisfactory and should never be used.

5. *The water added when testing cream.*—The water used to rinse out the pipette when cream is being tested should be neutral in reaction—i.e., it should be perfectly colourless when phenolphthalein is added to it, yet should turn pink when one drop of N/10 alkali is added to 9 ml. of water. There are a number of factories using bore or well waters which contain considerable quantities of sodium carbonate in solution. Such waters are alkaline and will neutralize at least a portion of the acidity. One case has been noticed where 9 ml. of water were responsible for neutralising 0·009 per cent. of acidity when 9 ml. of cream were used. The acidity tests in that particular factory would therefore be about 0·09 per cent. lower than the true percentage. In another case the water was distinctly acid, due to a clarification process, and tests using this water were higher than the true percentage. Water for the acidity test should not be taken from the hot water vessel used for the Babcock Test as this may be distinctly acid. A vessel recently washed with an alkaline cleanser may be responsible for considerable alkali being added with the water. If possible, distilled water (condensed steam) or rain water should be used.

6. *Accuracy of the decinormal sodium hydroxide.*—Most factories purchase their supply of decinormal sodium hydroxide solution from supply houses.

If kept in stock for too long a period a flaky sediment is formed by the action of the alkali on the glass. This may be very largely prevented by manufacturers coating the inside of the bottles with hard paraffin wax which is unaffected by alkali.

As usually prepared, the required weight of sodium hydroxide is weighed out and dissolved in the required volume of water, and the solution is then tested and corrected. This is somewhat unsatisfactory, as even the purest sodium hydroxide may contain up to 2 per cent. of sodium carbonate. This has the effect of causing the pink colour to appear and then fade rapidly although the total alkalinity may be correctly decinormal. A more satisfactory method of preparation is described later.

If the alkali solution is exposed to the air for any length of time, either by removing the stopper or allowing to stand in the burette, carbon dioxide is absorbed from the air, forming sodium carbonate. Care should therefore be taken to keep the stock bottle well corked and discard the alkali remaining in the burette after the final titration for the day.

7. *Depth of pink colour.*—The depth of colour developed during the titration has been noticed to vary considerably, depending apparently on the person performing the test. This may be due to inability on the part of the operator to detect the first tinge of pink, an insufficiency of phenolphthalein solution, carelessness, or ignorance of what is required. Some firms supply glass stirring rods in which are enclosed pink paper and the titration is supposed to proceed until the pink colour in the milk or cream matches that of the paper. This is not always successful as some milks and creams normally have a rich yellow colour and the

first change of colour noticeable is more orange than pink. Probably the most satisfactory method is to have a second cup in which is placed 9 ml. of the particular milk being tested, or 9 ml. of the particular cream and 9 ml. of water, alongside the operator. By comparison the first change of colour is easily noticed.

As the pink colour only develops slowly it is necessary to have sufficient phenolphthalein present to give a distinct pink with one or two drops of excess alkali. At least 5 drops of a 1 per cent. phenolphthalein solution should be added and the same quantity should be used for each test.

8. *Effect of carbon dioxide.*—Carbon dioxide, which is also known as carbonic acid gas, seriously affects the acidity test.

When carbon dioxide is present it combines with the sodium hydroxide and forms sodium bicarbonate and sodium carbonate. As the former compound decolourises phenolphthalein, erroneous results are obtained. When fermented or gassy creams are being tested the error may be 0·07 per cent. or even higher.

After cream is neutralized it is passed over the pasteuriser and the heating to which it is subjected liberates most of the carbon dioxide. If pasteurisation is followed by, or is simultaneous with, a vacuum treatment, it is probable that all carbon dioxide is liberated. It is because pasteurised cream thus contains less carbon dioxide than raw cream that the acidity following pasteurisation is generally lower than that desired. If very accurate acidity tests are desired for cream, the 9 ml. of cream and rinsings should be gently boiled for about 30 seconds. Having thus liberated the carbon dioxide the cream should be cooled and titrated as usual.

9. *Care of equipment.*—All equipment used in performing acidity tests should be thoroughly cleaned at the end of each day's work. After all milk, cream or other residues have been thoroughly removed, the pipettes and titration vessels should be rinsed several times with distilled (or rain) water. Pipettes should be allowed to drain by suspending vertically in a wooden rack and titration vessels can be dried with a clean cloth.

Particular attention is necessary in the care of a burette, especially if it is a glass-stoppered type. A solution of sodium hydroxide will quickly render the stopper immovable and daily washing out of the burette with the stopper removed is recommended. Before starting titrations the next day the stopper should be very lightly greased if it appears dry, and the burette should be rinsed out with a little of the titrating solution, which is then discarded.

Burettes having a short piece of well-fitting rubber tubing inserted between the base of the burette and the final glass tip are very suitable for acidity titrations. A small glass bead constricts the tubing and prevents the solution from running out. By pinching the tube, however, the liquid can pass around the bead and the titration can be easily accomplished. This type should also be washed out after the final use each day. Its great advantage is the elimination of cemented stoppers and the ease with which a replacement can be made at any time.

Preparation of Decinormal Sodium Hydroxide.

For those factories which have the services of a chemist available, the following method of preparation is strongly recommended. Dissolve one pound of the purest sodium hydroxide obtainable, preferably of "AnalaR" or "Guaranteed Reagent" quality, in one pound (450 ml.) of distilled water. This solution is to be allowed to stand for some days in a resistance glass vessel, or in a bottle internally coated with hard paraffin wax, securely stoppered with a rubber cork or waxed bark cork. After a few days the sodium carbonate, which is practically insoluble in such a strong solution of sodium hydroxide, will have settled to the bottom, leaving the supernatant liquid clear. This clear liquor, which contains about 50 per cent. by weight of caustic soda, has a specific gravity of about 1·53, and can be siphoned off into another similar container for storage purposes. This solution is of such strength that only from 5·5 to 6 ml. are required for each litre of decinormal solution required.

When diluting this strong solution preparatory to standardising, the distilled water should be boiled and cooled just prior to use. This is to free it from carbon dioxide which it absorbs from the air. Rain water may be used, but other waters are unsuitable. The diluted solution should be made slightly stronger than decinormal, as it is far easier to dilute the solution than to add a small amount of strong alkali during the subsequent adjustment.

A known volume of a standard acid solution (N/10 or N/5) is pipetted into a titration flask, one or two drops of phenolphthalein solution added, and then titrated with the approximately N/10 alkali until the pink colour remains for 20-30 seconds. (It will eventually disappear by the solution absorbing carbon dioxide from the air.) The required volume of water to be added may then be calculated as follows:—

Twenty ml. of standard N/10 acid (or 10 ml. of standard N/5 acid) required 19·1 ml. of the approximately N/10 alkali solution. If the alkali were accurately N/10 it would have required 20 ml. exactly. Say that there is 9,900 ml. of alkali solution left after the initial test. The amount of water to be added is then—

$$\frac{(20{\cdot}0 - 19{\cdot}1) \times 9{,}900}{19{\cdot}1} = \frac{0{\cdot}9 \times 9{,}900}{19{\cdot}1} = 466 \text{ ml.}$$

As a precautionary measure only 450 ml. of water should be added and the solution tested as before. When the solution is accurately adjusted at least two titrations should be made to confirm the standardization.

The solution should then be stored in tightly-corked resistance glass bottles or waxed bottles, labelled with the date and the name of the person who performed the standardization.

Preparation of Phenolphthalein Solution.

The indicator solution is prepared by dissolving 1 gram of phenolphthalein powder in 100 ml. of 90 per cent. alcohol. The alcohol need not be that known as rectified spirit, methylated alcohol or denatured alcohol being quite satisfactory. Methylated spirits, however, should not be used for the purpose.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S., Jersey, Guernsey and Ayrshire Societies' Herd Books, production records for which have been compiled during the months of October, November and December, 1948 (273 days unless otherwise stated).

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORN.					
Mature Cow (Standard 350 lb.).					
Trevlac Rosella	W. A. Freeman, Rosewood	9,455·45	416·75	Trevlac Premium	October
Pilton View Sadie 3rd	F. Derrick, Moonford	9,787·25	396·405	Sunnyview Myrtle's Renown	October
Yarranvale Merrymaid	W. D. Davis, Wambo	8,694·0	372·013	Trevor Hill Bosca	November
Lynfield Pearl	F. Birt, Sexton	10,043·95	356·137	Parkview Ransom	November
Trevor Hill Primrose 6th	Madge Bros., Southbrook	12,223·65	537·186	Alfa Vale Reflex	December
Navillus Show Girl 4th	C. O'Sullivan, Greenmount	15,115·7	501·086	Greyleigh Eros	December
Fernhome Emily	R. S. Griffiths, Moregatta	8,452·65	428·783	Glengarry Gem's Royal	December
Rhodesview Fanny 49th	W. Gierke, Helidon	10,048·6	408·522	Fairvale Major	December
Fernhome Hannah	R. S. Griffiths, Moregatta	7,558·2	387·385	Rosenthal Compensation	December
Fernhome Jessie	R. S. Griffiths, Moregatta	8,053·65	370·347	Glengarry Gem's Royal	December
Senior, 4 Years (Standard 330 lb.).					
Tara Plumber's Flower (365 days)	C. K. Roche, Wheatvale	12,007·1	505·843	Alfa Vale Plumber	October
Valera Nancy 2nd	D. Sullivan, Bantry, Pittsworth	10,475·0	430·48	Alfa Vale Pride 2nd	November
Senior, 3 Years (Standard 290 lb.).					
Rhodesview Butterfly 5th	Gierke and Sons, Helidon	7,849·3	339·351	Alfa Vale Nigel	October
Bantry Model	D. Sullivan, Pittsworth	9,239·05	398·365	Alfa Vale Pride 2nd	November
Navillus Shannon 11th	C. O'Sullivan, Greenmount	11,687·95	494·084	Greyleigh Eros	December
Junior, 3 Years (Standard 270 lb.).					
Dorravista Fussy 3rd	H. A. Turner, Tarzali	12,320·4	521·181	Byron of Glencoe	October
Rhodesview Nancy 69th	W. Gierke and Sons, Helidon	7,579·0	331·454	Alfa Vale Nigel	December
Senior, 2 Years (Standard 250 lb.).					
Derradale Countess	F. Derrick, Moonford	8,791·25	361·046	Applegarth Maxwell	October
Boah Peak Primrose 3rd	H. L. and C. I. Bruggemann, Kulpi	6,509·5	254·29	Fairvale Musketeer	October
Ronnee Lady May 9th	O'Connor Bros., Colinton	11,813·95	490·128	Ronnee Emblem	November
Rhodesview Daisy 3rd	W. Gierke and Sons, Helidon	7,623·4	294·898	Alfa Vale Nigel	November
Navillus Countess 5th	C. O'Sullivan, Greenmount	12,960·75	455·722	Parkview Limerick	December
Fernhome Rosette	R. S. Griffiths, Moregatta	7,601·4	322·775	Glengarry Gem's Royal	December
Navillus Gem 2nd	C. O'Sullivan, Greenmount	8,154·35	310·641	Parkview Limerick	December
Fermanagh Rosecleaf 5th	F. B. Sullivan, Pittsworth	6,188·14	283·035	Alfa Vale Pride 2nd	December
Navillus Charm 20th	C. O'Sullivan, Greenmount	6,959·95	268·476	Parkview Limerick	December
Fermanagh Sheila 3rd	F. B. Sullivan, Pittsworth	5,573·3	264·16	Valera Rosecleaf's Pride	December
Springleigh Primrose 21st (242 days)	H. T. Moller, Boonah	6,727·75	252·993	Blacklands Melba's Pride	December

Junior, 2 Years (Standard 230 Lb.).

Dorravista Fairy 15th	H. A. Turner, Tarzali	11,434·5	526·48	Byron of Glencoe	October
Alfa Vale Model 30th (365 days)	W. H. Thompson, Nanango	10,903·35	484·029	Alfa Vale Paisley	October
Murcott Clara 3rd	T. McLennan, Willowvale	7,355·05	286·299	Rozanna Red Radiance	October
Rosenthal Lilac 22nd	Mitchell and Mulcahy, Warwick	6,571·2	277·447	Corunna Potentate	October
Millievale Olive (249 days)	A. H. Webster, Stockyard Creek	7,112·9	275·722	Woodville Viscount	October
St. Andrews Violet	M. C. Lester, Glengallon	5,540·05	258·025	Bingleigh Premier	October
Murcott Laurel II	T. McLennan, Willowvale	6,401·2	255·386	Murcott General	October
Roshill Stella Girl	W. Flesser, Boyland	7,084·15	253·044	Dnalwon Felix	October
Rosenthal Choice 22nd	Mitchell and Mulcahy, Warwick	6,035·95	238·317	Corunna Potentate	October
Fairlie Bud 25th	Mitchell and Mulcahy, Warwick	5,907·75	236·694	Rosenthal Lilac 4th Emblem	October
Alascan Bess	A. Lohse, Biggenden	6,960·5	297·23	Sunnyview Ruby's Elect	November
Bunya View Dora	K. Berghofer, Athol	5,698·96	257·622	Trevor Hill Progress	November
Bunya View Rosette 5th	W. D. Davis, Wambo	5,856·6	240·903	Trevor Hill Progress	November
Alascan Red Rose 2nd	A. Lohse, Biggenden	7,005·35	232·496	Sunnyview Ruby's Elect	November
Valera Bonny 14th	Sullivan Bros., Pittsworth	8,082·3	397·387	Alfa Vale Pride 2nd	December
Faimoye Plum 2nd	C. K. Roche, Warwick	6,058·5	248·307	Sunbridge Expert	December
Bunya View Rosemary	Edward Bros., Kingaroy	5,657·25	245·221	Trevor Hill Progress	December
Aynsley Gwen 10th	V. R. Nugent, Murgon	6,648·45	239·871	Alfa Vale Pride 6th	December
Applegarth Colleen 5th	R. A. and N. K. Shelton, Hivesville	6,425·0	236·471	Fairholm Monty	December

JERSEY.

Mature Cow (Standard 350 Lb.).

Inverlaw Patricia	R. J. Crawford and Sons, Kingaroy	6,699·5	408·679	Inverlaw Saturn	October
Brooklands Primrose	W. S. Conochie, Sherwood	7,313·35	395·753	Brooklands Padishah	October
Oxford Spotted Morel	V. Granger, Nerang	7,315·4	385·461	Oxford Peer	October
Kinross Lana	R. J. Bott, Tiaro	7,943·5	367·734	Glenview Royal Diamond	October
Kathleigh Vanity	F. W. Kath, Moffatt	8,760·41	450·9	Kathleigh Jersey King II	November
Glenrandle Nisa 2nd	M. J. Kerlin, Killarney	8,072·7	440·008	Bellgarth Stylish	November
Boree Tinklebelle	W. and C. E. Tudor, Gayndah	8,460·38	413·802	Maurfield Larkspur's Gift	November
Romsey Brown May	J. Wilton, Killarney	7,939·6	413·284	Oxford Dainty Peer	November
Romsey Flower	J. Wilton, Killarney	7,201·1	363·260	Oxford Dainty Peer	November
Tecoma Golden Darling	A. Semgreen, Coolabunia	5,796·6	358·837	Trinity Golden Royal	December

Senior, 4 Years (Standard 330 Lb.).

Nairfale Princess Beth (365 days)	R. J. Browne, Yangan	8,706·8	434·692	Nairfale Noble Count	November
Nairfale Noble's Rosemary	R. J. Browne, Yangan	8,698·9	404·382	Nairfale Pride's Noble	November
Bellgarth Fairy 4th	D. R. Hutton, Cunningham	7,114·55	381·056	Trecarne Victor 2nd	November

Junior, 4 Years (Standard 310 Lb.).

Glenrandle Larkspur	P. Kerlin, Killarney	8,912·4	483·856	Bellgarth Glory King	October
Kathleigh Carmel	F. W. Kath, Moffatt	8,376·57	456·008	Trecarne Quality Lad	October
Pinegrove Betty	J. W. Evans, Tallegalla	5,429·35	317·616	Glenview Victor	October
Brookland Merry Melrose	H. T. W. Barker, Oakey	6,556·15	387·164	Bulby Maria's Keepsake	November
Kinross Dorothy 2nd	H. R. Randall, Woowoonga	7,944·0	330·516	Kinross Jester	November
Kathleigh Flicka	F. W. Kath, Moffatt	7,578·69	395·085	Oxford Daffodil's Victor	December
Gunawah Marguerite	R. D. Johnson, Kingaroy	7,710·85	356·385	Gunnawah Jack Frost	December

Senior, 3 Years (Standard 290 Lb.).

Gem Ishma	W. Bishop, Kenmore	8,379·4	397·331	Bulby Oxford Gamboge	October
Nairfale Neat Neta	R. J. Browne, Yangan	6,802·8	351·654	Nairfale Counts Paymaster	October
lenrandle Spotted Lady	P. Kerlin, Killarney	5,412·0	311·220	Oxford Noble Peer	October
m Dolores	W. Bishop, Kenmore	9,503·3	445·762	Bulby Oxford Gamboge	December

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.	Month Compiled.
		Lb.	Lb.		
JERSEY—*continued.*					
JUNIOR, 3 YEARS (STANDARD 270 LB.).					
Kathleigh Bonnie	F. W. Kath, Moffatt	7,853·56	408·606	Oxford Daffodil's Victor	October
Trinity Bright Lass	J. McCarthy, Budgee	7,453·8	379·783	Trinity Crowning Effort	October
Westbrook Sylvia 23rd	Farm Home for Boys, Westbrook	6,162·55	296·057	Selsey Royal Standard	October
Windsor Lady Alice	H. W. Barker, Oakey	5,321·25	270·829	Brookland Sultan's Victory	October
Gem Claudia	W. Bishop, Kenmore	9,155·85	416·373	Gem Valour	November
Gem Violet	R. W. Webb, Stafford	5,783·1	356·318	Englorie Cunning Victor	November
Palen Lady Optician	Prison Farm, Palen Creek	6,346·45	326·713	Palen Optician	November
Trinity National Wedding	J. S. McCarthy, Greenmount	5,860·3	287·537	Trinity National Victory	November
Ashview Locket 3rd	C. Huey, Sabine	7,375·1	388·66	Trecarne Victor 4th	December
Kathleigh Brown Maid	F. W. Kath, Moffatt	6,443·25	370·611	Kathleigh Silveen's Victory	December
Ashview Queen 2nd	C. Huey, Sabine	6,536·0	341·595	Trecarne Victor 4th	December
Tecoma Melody	A. Semgreen, Coolabunia	4,888·1	285·198	Trinity Golden Royal	December
SENIOR, 2 YEARS (STANDARD 250 LB.).					
Gem Magna	W. Bishop, Kenmore	8,064·0	435·567	Bulby Oxford Gamboge	October
Upwell Miss Binstead	B. T. Seymour, Kapaldo	5,996·5	313·984	Glenview Some Sultan	October
Lynbell Milkmaid	C. S. Coleman, Beaudesert	5,523·8	294·973	Hocknell Ginger Star	November
Bonathorne Fashion's Pride	D. R. Hutton, Cunningham	5,151·55	270·041	Woodside Winston	November
Silverbrook Brighteyes	J. Schull, Oakey	4,588·45	263·115	Lermont Ambassador 2nd	November
Burnlea Mischief	R. O. M. Unkles, Didcot	5,104·55	256·426	Burnlea Aviator 4th	November
Kathleigh Silver 3rd	C. W. and E. M. Barlow, Boodua	6,076·05	359·555	Oxford Fawn's Noble	December
Kathleigh Letren 2nd	C. W. and E. M. Barlow, Boodua	5,434·0	336·465	Oxford Fawn's Noble	December
JUNIOR, 2 YEARS (STANDARD 230 LB.).					
Mayfair Golden Slipper IV.	J. W. Carpenter, Helidon	4,560·55	294·718	Lermont Double Volunteer	October
Woodview Jersey Queen	P. H. Schull, Oakey	4,686·85	283·296	Woodview Some Victory II.	October
St. Joseph's Hazel 3rd	P. J. Bygrave, Aspley	5,198·75	259·404	St. Joseph's High Design	October
College Mistletoe 2nd	Queensland Agricultural High School and College, Lawes	4,803·4	253·618	Westbrook Ambassador 52nd	October
Myrtledale Sea Green	C. J. McKell, Jaggan	3,601·8	250·013	Myrtledale Northern Star	October
Nairfale Comedy's Design	R. J. Brown, Yangan	4,523·3	244·418	Kelvinside Handsome Boy	October
Ashview Queen 3rd	C. Huey, Oakey	4,704·75	237·973	Trecarne Victor 4th	October
Bellgarth Royal Lady	D. R. Hutton, Cunningham	6,500·9	348·707	Romsey Spotted King	November
Woodview Lillian	P. H. Schull, Oakey	5,603·5	345·846	Woodview Officer	November
Kathleigh Brownie	F. W. Kath, Moffatt	6,306·31	314·95	Oxford Fawn's Noble	November
Upwell Gay Guest	E. W. Goody, Bancroft	5,799·75	307·440	Glenview Some Sultan	November
Glenrandle Chimes	P. Kerlin, Killarney	6,065·2	294·826	Bellgarth Glory King 2nd	November
Oxford Thoreen	Queensland Agricultural High School and College, Lawes	5,282·15	291·677	Glenside Golden Victory	November
Kathleigh Sylkyle	F. W. Kath, Moffatt	5,422·07	282·737	Oxford Fawn's Noble	November

Glenrandle Fashion 2nd	P. Kerlin, Killarney	5,588·0	276·252	Waltham Farm Brown Boy	November
Glenrandle Brown Maid	P. Kerlin, Killarney	5,781·4	272·860	Waltham Farm Brown Boy	November
Romsey Brown Model	J. Wilton, Killarney	4,509·2	244·925	Beligarth Ruler 4th	November
Nairfale Chenille	R. J. Browne, Yangan	4,924·5	238·262	Kelvinside Handsome Boy	November
Kathleigh Singer	F. W. Kath, Moffatt	6,125·42	344·728	Oxford Fawn's Noble	December
Kathleigh Valencia	F. W. Kath, Moffatt	6,909·69	344·245	Oxford Fawn's Noble	December
Upwell Funny Fawn	E. W. Goody, Bancroft	6,346·25	330·497	Kenview Some Sultan	December
Kathleigh Patricia 4th	C. W. and E. M. Barlow, Boodua	5,360·6	325·635	Oxford Fawn's Noble	December
Weelu Lucky Effort	C. W. and E. M. Barlow, Boodua	5,409·05	324·434	Trinity Lily's Effort	December
Kathleigh Laurette	F. W. Kath, Moffatt	5,953·56	323·921	Oxford Fawn's Noble	December
Lermont Tinklebell 2nd	J. Schull, Oakey	6,017·55	320·566	Trinity Graceful Duke	December
Kathleigh Spotted Peerless	F. W. Kath, Moffatt	6,352·53	317·915	Oxford Fawn's Noble	December
Kenilworth Nellie	J. L. Evans, Cooroy	5,665·8	275·788	Rosevale War Bond	December
Kathleigh Fashionette II.	C. W. and E. M. Barlow, Boodua	4,665·55	275·079	Oxford Fawn's Noble	December
Kathleigh Prissie 2nd	C. W. and E. M. Barlow, Boodua	4,436·85	260·549	Oxford Fawn's Noble	December

GUERNSEY.

Mature Cow (Standard 350 lb.).

Linwood Sugar	H. Sanderson, Moonford	9,054·0	463·040	Warrawong Winter	October
Fernhill Ivy	H. Sanderson, Moonford	8,349·5	437·682	Laureldale Pluto	October
Fernhill Hollyhock	H. Sanderson, Moonford	8,445·5	414·924	Laureldale Peace Boy	October
Adaville Olga	J. M. Cooke, Witta	7,898·55	433·446	Laureldale Rockefeller	November

Junior, 2 Years (Standard 230 lb.).

Linwood Trilby	E. G. Foxton, Maleny	4,279·15	230·863	Tattenbar Onward	October
Glenoak Bella	W. A. K. Cooke, Witta	5,376·8	283·635	Rosewood Bell Boy	November
O Kay Honey	H. Sanderson, Moonford	6,610·5	315·793	Linwood Goldfinde	December

AYRSHIRE.

Junior, 2 Years (Standard 230 lb.).

Leafmore Hoaken	J. P. Ruhle, Motley	6,231·8	252·286	Myola Juggler	November

New Pure Bred Production Recording Scheme.

The following rules for official production recording of pure bred dairy cattle by the Department of Agriculture and Stock will come into operation in July, 1949:—

General.

1. This scheme shall be known as the Government Official Pure Bred Dairy Cattle Production Recording Scheme.

Official Year.

2. The official year shall commence on the first day of July and end on the thirtieth day of June.

Cows Eligible for Recording.

3. (*a*) The owner of any herd of pure bred cattle may apply for entry of his herd and shall pay the prescribed fee therefor.

(*b*) Only those cows will be accepted for test which are registered or are eligible for registration in a recognised Herd Book or Pure Stock Register.

(*c*) The owner may enter any such cows but all cows in their first lactation period shall be recorded with such exemption as set forth in Rule 18, provided that at least one-third of the registered pure bred females in the herd, with a minimum of five animals, shall be entered for recording during the year.

(*d*) The owner shall supply to the Director of Dairying when first entering cows for recording, and on 1st July in each subsequent year, an inventory of all pure bred animals on his farm.

(*e*) When a breeder owns more than one herd on separate farms each herd shall be considered and recorded as a separate herd. Any cow commencing her record on one farm shall be credited to the herd on that property though she may complete her record on another property of the same owner.

(*f*) The Recorder shall record the identification number and markings of each animal on an approved form prepared for the purpose by the Department of Agriculture and Stock. He shall check these particulars on each test and shall satisfy himself as to the identity of each animal. If the cow is not marked according to the records of the particular Breed Society, or the markings are indistinct, the Recorder shall report the fact to the Director of Dairying, who will report to the Society and the matter will then become an issue between the Society and the owner. Pending finality the cow will be recorded but no figures of production will be published.

Fees for Recording.

4. (*a*) Each herd owner shall pay to the Department of Agriculture and Stock on entry of his herd and annually thereafter a herd entry fee of £2 together with a fee of 10s. renewable at each lactation for each cow submitted for recording.

(*b*) On withdrawal of a herd, recording of all cows shall cease unless the owner is prepared to pay for each cow calving in the interim and up to actual date of withdrawal.

Period of Official Test.

5. (*a*) The official lactation period shall be 273 days. This may be extended to 305 or 365 days, on the request of the owner, provided the cow has produced the standard amount of butterfat as prescribed in Rule 17. Such request must be submitted to the Director of Dairying not later than one month prior to the expiration of the 273 days period.

The official lactation period shall commence five clear days after calving. The first five days' yield after calving shall not be included in the recording period.

Computing Official Records.

6. The yield for the official lactation period shall be calculated as follows:—

(*a*) The lactation period shall consist in the case of the 273 days record of 9 sub-periods, covering respectively 8 sub-periods of 30 days and 1 of 33 days; in the case of the 305 days record it shall consist of 9 sub-periods of 30 days and 1 of 35 days; in the case of the 365 days record, of 11 sub-periods of 30 days and 1 of 35 days, except in the case of cows not completing in full the final sub-period, in which case the lactation shall conclude with a sub-period of the completed number of days.

(*b*) The cows shall be recorded once in each sub-period at approximately equal intervals of time.

(*c*) The official yield shall be the sum of the yields of each sub-period.

(*d*) The yield for each sub-period shall be calculated as follows:—

The milk yield shall be the amount (lb.) of milk yielded over 24 hours multiplied by the length of the sub-period.

The butterfat yield shall be the amount of butterfat (lb.) calculated by test of the same 24 hours' milk yield multiplied by the length of the sub-period.

7. The recordings shall be carried out as far as possible at intervals of 30 days (vide rule 6 (*b*)). In the event of it not being possible so to do the recordings may be carried out not more than 35 days nor less than 25 days after the preceding recording, and if this is not practicable, the calculations for the period under record shall be averaged as in the case of an abnormal recording (vide rule 8), except that, in addition to the records of the preceding and succeeding recordings, the weights and tests of the sub-period under review when taken will also be included.

Additional visits may be made for the purpose of taking supplementary samples at any time.

Averaging Abnormal Records.

8. In the case of a cow appearing to be sick or recording abnormally, i.e., more than 25 per cent. above or below average of the proximate and succeeding recordings, such recordings shall not be registered, but an average shall be made from the proximate and succeeding recordings. The same course shall also be followed in the case of a cow whose sample is, or has become, unavailable for correct testing. Any such sickness shall be reported to the Department by the Official Recorder. Where the

first test is abnormal or the sample is or has become unavailable it shall be discarded, and the yield for the first sub-period shall be calculated on the average test of the next two periods.

Where First Test is Taken More than 35 Days after Calving.

9. When an owner commences to record his herd for the first time or where it has been impracticable to record certain cows until after they have calved for a period of more than 35 days, the Director of Dairying may, on receipt of a statutory declaration from the owner, or other acceptable proof as to the date of calving, credit such cows' yields with 60 days' production, based on the first 24 hours' record. Cows which have calved more than 60 days before the first test shall not be accepted for recording until the next lactation period.

Who shall be Official Recorders.

10. (*a*) The Official Recorder shall be an officer of, or approved by, the Department of Agriculture and Stock.

Where Testing shall be Carried Out.

10. (*b*) Testing shall be carried out either on the farm or the samples may be taken by the Recorder under adequate protection to be tested at some approved centre.

Official Supervision.

11. The owner must state at the time of entry, or when requested by the Recorder, the hours at which he intends to commence milkings. These times are then to be regarded as the scheduled milking hours, and must not be varied without first giving the Director of Dairying seven days' preliminary notice. The Recorder shall have the right to see that all cows are milked out under his supervision at the milking prior to the official 24 hours' test commencing and shall note the time each individual cow shall be finished so that the 24 hour period shall not be exceeded.

Daily Weighing and Recording.

12. (*a*) In recording such cow as provided for in Rule 6 (*b*) the Recorder shall weigh, on officially approved scales, the milk yield at each of the consecutive milkings which are to constitute the test and record same. After thoroughly mixing such milk the Recorder shall take a sample for the official test. The milk from each milking may be recorded and tested as separate units, or a composite sample may be taken of the milkings. No milk weight shall be credited to any cow unless the aggregate of all milkings in the 24 hours totals 4 lb. or over.

(*b*) No cow shall be stripped more than once after each milking during the recording. Where milking machines are used stripping (if practised) shall be carried out immediately after the machines are removed. Where cows are milked by hand the milking and stripping shall constitute one operation.

(*c*) Where cows are being milked by machines a vacuum bucket shall be used during the period of the Recorder's visit.

Number of Milkings per Day.

13. No cow shall be milked more than twice per day unless she is yielding more than 60 lb. of milk per day. In such circumstances milking three times per day may be permitted only until such time as the yield falls to 50 lb. per day, when twice per day milking must be practised.

The Director of Dairying may, under special circumstances, permit a variation of the above condition.

Accommodation of Recorders.

14. Every facility is to be afforded by the herd owner to Recorders carrying out their duties in connection with the scheme and accommodation shall be provided overnight if necessary.

Particulars of Date of Calving, &c.

15. (*a*) Owners must supply on the request of the Director of Dairying particulars as to the date of calving and services, manner of feeding and details as to the class, quantity of food, &c., and any other details regarding the rations fed during the period of the test and when requested by the Director of Dairying shall allow samples of the different foods used to be taken for analysis.

(*b*) All particulars required by the Director of Dairying shall be made by statutory declaration when deemed necessary.

Issue of Records.

16. (*a*) All calculations shall be made, recorded and published in terms of pounds of milk and butterfat only.

(*b*) Records of all cows submitted to the official recording shall be published, including those that fail to reach the official standard, and cows milked three times per day shall be indicated.

17. The standards for 273 days period upon which certificates shall be issued are as follows:—

Junior 2 year old	..	..	..	230	lb.	butterfat
Senior 2	„	„	..	..	..	250	„	„
Junior 3	„	„	..	..	..	270	„	„
Senior 3	„	„	..	..	..	290	„	„
Junior 4	„	„	..	..	..	310	„	„
Senior 4	„	„	..	..	..	330	„	„
Mature cows	..	..	..	..	350	„	„

"Junior" applies to any animal whose date of freshening falls within the first six months of the age indicated and "Senior" within the second six months.

Exemptions.

18. (*a*) Exemption from the test may be granted on a written application from the owner stating exceptional circumstances and endorsed by the Director of Dairying in respect of cows that are sick, diseased or injured, in such a manner as, in the opinion of the Director of Dairying, to seriously impair such cow's capacity for milk production.

(*b*) Any cow that aborts her calf during a lactation period shall forthwith be withdrawn from the test; she may, however, be re-entered for a new lactation if the owner so desires.

Feeding Milk or Cream to Cows.

19. The feeding of whole milk or cream to cows undergoing recording is prohibited as being a wasteful practice. Any records obtained from cows so fed will be disallowed.

Disqualifications.

20. Should the owner of any herd entered for recording not conform to these regulations, or by any act or improper practice pervert the record of the herd or any cow thereof, such herd shall be subject to disqualification for such period as the Minister may determine.

21. No person who has at any time been a member of the Scheme shall have any claim for damages of any nature whatsoever against His Majesty the King, the Government or any officer or employee of the Government for anything done or omitted to be done in connection with the Scheme and the recording of any cow.

Interpretation.

22. In all matters relating to recording, the ruling of the Director of Dairying shall be final.

QUEENSLAND SHOW DATES.

Barcaldine	May 13-14
Beaudesert	May 6-7
Beenleigh	September 16-17
Biggenden	April 28-29
Blackbutt	June 3-4
Boonah	June 3-4
Bowen	July 6-7
Brisbane R.N.A.	August 6-13
Bundaberg	June 9-11
Cairns	July 19-21
Charleville	May 18-19
Childers	June 6-7
Chinchilla	April 7-9
Cooyar	March 12
Crow's Nest	May 27-28
Dalby	March 31-April 2
Dirranbandi	May 27-28
Esk	July 1-2
Gatton	July 21-23
Gayndah	April 21-22
Gin Gin	June 13-14
Goombungee	May 21
Goomeri	May 24-25
Goondiwindi	April 30-May 2
Gympie	May 26-28
Home Hill	July 1-2
Ingham	July 15-16
Inglewood	March 11-12
Ipswich	May 17-19
Jandowae	April 4-5
Kalbar	May 28
Kilcoy	June 24-25
Kilkivan	June 10-11
Kingaroy	May 5-7
Laidley	July 8-9
Lawnton	July 29-30
Longreach	May 3-5
Lowood	June 10-13
Mackay	June 28-30
Maleny	May 12-13
Marburg	May 13-14
Maryborough	June 2-4
Miles	April 12-13
Millmerran	March 1-2
Mitchell	May 11-12
Mount Morgan Show	June 2-3
Mt. Morgan Camp Draft	June 4
Mundubbera	May 6-7
Murgon	May 19-21
Nambour	July 7-9
Nanango	April 28-30
Oakey	March 4-5
Pittsworth	March 8-9
Proserpine	July 1-2
Redlands	July 15-16
Rockhampton	June 22-25
Roma	May 4-5
Rosewood	July 15-16
Tara	March 29-30
Toogoolawah	June 17-18
Toowoomba	March 19-24
Townsville	July 12-14
Wallumbilla	April 29-30
Warrill View	May 21
Wondai	May 12-14
Woodford	July 15-16
Yarraman	April 22-23

Queensland Cheese Production, 1947-48

Compiled by Officers of the Division of Dairying.

THE quantity of cheese produced in Queensland during the year 1947-48 was 21,595,525 lb. This figure exceeds that of the previous year by 4,303,757 lb. but is the second lowest since 1941-42. Excellent seasonal conditions were experienced during the year, so the low production cannot be attributed to dry weather. It appears that the State has passed the peak of cheese production reached during the wartime diversion of milk to cheese manufacture and the figures may be expected to decline still further. This decline is being hastened by the closure of some of the smaller factories, four having ceased operations during the year 1947-48, and the increasing requirements of the whole milk trade.

The following figures show the variations in production over the past 10 years:—

	Tons.		Tons.
1938–1939	7,031	1943–1944	10,733
1939–1940	6,179	1944–1945	10,017
1940–1941	5,237	1945–1946	12,028
1941–1942	7,292	1946–1947 (Dry Year) ..	7,720
1942–1943	12,730	1947–1948	9,641

Grading.

The total quantity of cheese graded during the year was 14,155,705 lb. Quality was lower than in the previous two years, the comparative figures being:—

—	Choice and First.	Second.	Third.
	Per cent.	Per cent.	Per cent.
1945–1946	70·27	28·28	1·45
1946–1947	72·19	25·88	1·93
1947–1948	63·00	34·40	2·44

Quality is a matter to which the leaders of the industry might give greater attention. It is regrettable that of 44 factories submitting cheese for grading, only 13 had any cheese graded as choice and in only four cases did the quantity exceed 5 per cent. of the amount submitted.

Detailed statistics showing the production and gradings of individual factories are set out in the accompanying tables.

SUMMARY OF CHEESE PRODUCTION AND GRADINGS FOR THE YEAR 1947–1948.

	Lb.	
Milk Received ..	212,780,871	Yield of cheese per 100lb. milk, 10·15 lb.
Cheese Made	21,595,525	Yield per pound of butterfat, 2·61 lb.
Butterfat Paid For ..	8,282,597	Average Butterfat Test of Milk, 3·89%

GRADINGS.

Total Submitted.	Choice.	First.	Second.	Third.	Prohibited Export.
Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
14,155,705 ..	204,955	8,711,940	4,870,136	345,459	22,215
	1·45%	61·55%	34·40%	2·44%	·16%

MANUFACTURE AND GRADINGS OF QUEENSLAND CHEESE FACTORIES FOR THE YEAR ENDED 30TH JUNE, 1948.

Factory.	Milk Received.	Production and Yield.					Official Gradings.					
		Cheese Green Weight.	Butterfat.	Cheese Yield.		Average Test.	Total Submitted.	Choice.	First.	Second.	Third.	Prohibited Export.
				Per 100 Lb. Milk.	Per Lb. Butterfat.							
	Lb.	Lb.	Lb.	Per cent.	Per cent.	Per cent.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
*Aubigny	314,810	33,534	11,962	10·65	2·80	3·8	39,728	..	38,219	1,510	..	..
								..	96·2%	3·8%	..	..
Biddeston	7,640,293	821,149	287,696	10·75	2·85	3·77	503,597	..	455,746	47,693	158	..
								..	90·5%	9·47%	·03%	..
Coalstoun Lakes	2,137,602	220,097	81,515	10·3	2·7	3·81	86,226	..	..	53,099	32,647	480
								..	..	61·58%	37·86%	·56%
Daredale	2,296,170	225,888	87,086	9·84	2·59	3·79	229,428	..	103,591	120,457	5,380	..
								..	45·15%	52·50%	2·35%	..
Downs, Boodua	2,609,684	263,525	108,648	10·1	2·43	4·16	230,041	..	77,473	128,126	23,422	..
								..	33·68%	56·13%	10·19%	..
Downs, Toowoomba ..	27,939,814	2,762,884	1,995,640	9·90	2·52	3·93	2,855,897	..	786,137	1,936,005	123,787	9,968
								..	27·53%	67·79%	4·33%	·35%
Dundarrah	1,326,800	129,660	50,817	9·77	2·55	3·83	37,809	..	..	16,775	21,034	..
								..	..	44·37%	55·63%	..
Felton	4,228,443	439,846	161,034	10·40	2·73	3·81	249,083	..	148,466	84,915	15,702	..
								..	59·61%	34·09%	6·3%	..
Greenmount	3,311,370	354,308	123,668	10·7	2·86	3·73	140,267	..	8,004	129,133	3,130	..
								..	5·71%	92·06%	2·23%	..
Highgrove	1,635,449	167,022	62,619	10·21	2·67	3·83	150,722	..	13,324	134,545	2,853	..
								..	8·84%	89·26%	1·89%	..
Irongate	3,874,521	386,202	143,091	9·97	2·7	3·71	354,328	21,720	299,258	32,385	965	..
								6·13%	84·46%	9·14%	·27%	..
Kelvinhaugh	1,516,204	158,214	56,903	10·43	2·78	3·75	136,217	..	117,922	18,295	..	..
								..	86·57%	13·43%	..	..
Kooroongarra	4,465,901	455,789	165,281	10·21	2·76	3·7	462,875	14,823	413,144	34,908	..	..
								3·2%	89·26%	7·54%	..	..
Lilyvale	2,319,791	248,699	89,411	10·72	2·78	3·85	240,513	20,999	210,056	9,458	..	..
								8·73%	87·34%	3·93%	..	..
Maclagan, Maclagan ..	8,357,292	837,755	316,441	10·02	2·65	3·79	478,858	..	139,008	324,711	15,109	..
								..	29·03%	67·82%	3·15%	..
Maclagan, Kulpi	7,050,876	689,550	261,265	9·78	2·64	3·71	678,944	..	466,891	205,716	6,307	..
								..	68·77%	30·30%	·93%	..
Malling	5,992,561	579,922	233,817	9·68	2·48	3·90	..	..	..	..	..	..
								..	..	..	..	..
Maryborough, Tansey ..	5,894,472	610,957	253,362	10·36	2·41	4·3	247,779	31,688	216,091	..	..	..
								12·79%	87·21%	..	..	..
Maxam, Cooranga North ..	6,070,833	665,406	249,971	10·96	2·66	4·12	596,032	1,437	588,903	5,692	..	..
								·24%	98·8%	·96%	..	..
Moola	4,208,853	420,000	153,247	9·98	2·74	3·64	315,387	1,868	227,853	84,055	1,611	..
								·59%	72·25%	26·65%	·51%	..
Mount Sibley	2,940,923	311,580	111,986	10·59	2·78	3·81	249,283	..	248,871	412	..	..
								..	99·83%	·17%	..	..
Mount Tyson	6,660,493	687,368	249,784	10·32	2·75	3·75	89,222	2,004	79,880	7,338	..	..
								2·25%	89·53 %	8·22%	..	..

P ttsworth, Pittsworth ..	5,710,030	605,124	235,989	10·60	2·56	4·13	233,774	9,569	216,214	6,100	..	1,891
								4·09%	92·49%	2·61%	..	·81%
†Pittsworth, Brookstead ..	1,515,141	157,761	57,691	10·41	2·73	3·81	126,423	..	94,153	32,270	..	..
								..	74·47%	25·53%	..	..
Pittsworth, Linthorpe ..	2,513,842	258,320	94,507	10·28	2·73	3·76	108,228	..	73,575	34,653	..	..
								..	67·98%	32·02%	..	..
Pittsworth, Scrubby Mountain	2,267,374	242,174	86,940	10·68	2·79	3·83	133,556	550	94,097	36,547	1,896	466
								·41%	70·46%	27·36%	1·42%	·35%
Pittsworth, Springside ..	2,403,198	257,780	89,672	10·73	2·87	3·73	202,833	89,313	108,704	4,816	..	..
								44·03%	53·59%	2·38%	..	..
Pittsworth, Yarranlea ..	4,323,943	445,813	164,336	10·31	2·71	3·8	220,408	..	133,793	85,194	1,421	..
								..	60·70%	38·65%	·65%	..
Port Curtis, Bracewell ..	4,240,030	415,756	151,124	9·81	2·75	3·56	338,821	..	307,761	28,332	2,728	..
								..	90·83%	8·36%	·81%	..
Port Curtis, Theodore ..	2,996,236	307,452	112,958	10·26	2·72	3·77	36,704	1,468	24,969	1,857	..	8,410
								4·0%	68·03%	5·06%	..	22·91%
Q.A.H.S. and College, Lawes	29,487	3,135	1,229	10·63	2·55	4·17	..	..	..	..	..	..
								..	..	..	..	..
Quinalow	6,137,851	626,017	234,837	10·2	2·67	3·83	213,077	..	134,709	74,411	3,957	..
								..	63·22%	34·92%	1·86%	..
Ramsay	1,892,077	193,260	74.486	10·21	2·59	3·94	167,323	..	115,296	52,027	..	..
								..	68·91%	31·09%	..	..
Rockview	2,227,329	236,632	84,677	10·62	2·79	3·80	144,323	..	130,523	13,800	..	..
								..	90·44%	9·56%	..	..
Rocky Creek	3,789,050	391,719	141,219	10·34	2·77	3·73	361,615	..	248,389	103,174	10,052	..
								..	68·69%	28·52%	2·79%	..
Rosemount	3,243,186	312,415	124,494	9·63	2·51	3·84	247,961	..	78,566	126,652	42,743	..
								..	31·68%	51·08%	17·24%	..
Southbrook	7,046,822	723,450	261,659	10·27	2·76	3·71	368,973	2,416	294,212	70,615	1,574	156
								·65%	79·74%	19·14%	·43%	·04%
South Burnett, Goomeri ..	6,145,349	634,976	252,443	10·33	2·52	4·11	586,174	..	523,482	62,071	621	..
								..	89·30%	10·59%	·11%	..
South Burnett, Murgon ..	6,003,089	588,436	241,777	9·8	2·43	4·03	459,256	..	430,360	28,578	318	..
								..	93·71%	6·22%	·07%	..
Sugarloaf	1,853,334	188,640	75,688	10·18	2·49	4·08	80,608	..	80,608	..	..	..
								..	100%	..	..	..
Sunnyvale	1,633,990	171,626	64,972	10·5	2·64	3·98	143,357	..	49,594	83,891	9,399	473
								..	34·59%	58·52%	6·56%	·33%
Warwick, Greymare ..	2,291,129	233,512	87,217	10·19	2,68	3·81	146,467	..	37,271	105,276	3,920	..
								..	25·45%	71·88%	2·67%	..
Warwick, Talgai	1,109,338	109,722	41,372	9·89	2·65	3·73	..	..	..	..	..	..
								..	..	..	..	..
Warwick, Victoria Hill ..	585,910	61,568	21,466	10·51	2·87	3·66	..	..	..	..	..	..
								..	..	..	..	..
Warwick, Mill Hill	21,748,357	2,095,870	909,712	9·64	2·3	4·18	797,315	7,100	611,703	176,146	1,442	924
								0·89%	76·72%	22·09%	·18%	·12%
Woodleigh	1,393,627	139,327	52,723	10·00	2·64	3·78	130,952	..	20,473	101,481	8,551	447
								..	15·63%	77·5%	6·53%	·34%
Yamsion	3,280,659	353,735	123,949	10·78	2·85	3·78	349,665	..	147,720	198.330	3,115	..
								..	42·25%	56·86%	·89%	..
Yarqullen	3,696,394	384,729	142,610	10·41	2·70	3·86	185,656	..	116,932	67,127	1,597	..
								..	62·98%	36·16%	·86%	..
Totals	212,780,871	21,595,525	8,282,597	..	..	..	14,155,705	204,955	8,711,940	4,870,136	345,459	22,215
								1·45%	61·55%	34·40%	2·44%	·16%

* Ceased operations 30–9–47.

† Closed from 1–4–48 to 30–6–48.

DIVISION OF DAIRYING.

GROUP HERD RECORDING SCHEME.

Summary of Herd Recording Units for December, 1948.

District.	No. of Herds.	No. of Cows.	Group Daily Average.			Average of Highest Herd.		
			Milk. Lb.	Test. %	Fat. Lb.	Milk. Lb.	Test. %	Fat. Lb.
Beaudesert ..	17	888	16·58	4·11	·681	21·64	5·07	1·097
Maleny No. 1 ..	17	713	15·02	4·64	·697	19·51	5·58	1·089
Maleny No. 2 ..	17	694	16·04	4·56	·732	32·86	4·91	1·615
Oakey No. 1 ..	22	715	18·91	4·34	·822	22·21	5·31	1·178
Oakey No. 2 ..	22	746	20·44	4·23	·865	34·7	3·96	1·373
Goomeri	17	678	13·02	3·82	·498	19·64	4·37	·859
Cooroy No. 1 ..	22	780	10·2	3·84	·391	25·89	4·15	1·075
Cooroy No. 2 ..	22	675	8·67	3·89	·337	11·7	4·35	·509
Kingaroy No. 1 ..	20	784	14·54	3·93	·572	25·11	4·01	1·016
Kingaroy No. 2 ..	20	723	18·21	3·88	·706	24·77	4·03	·998
Cedar Pocket ..	22	626	16·55	4·31	·714	25·53	4·35	1·111
Monto	21	772	21·77	4·07	·886	32·44	3·99	1·296
Pomona	16	614	13·8	3·92	·541	20·82	4·25	·885
Miva-Theebine ..	16	733	12·66	4·25	·538	15·2	4·51	·685
Warwick	20	720	22·1	3·84	·847	34·66	3·94	1·365
Kenilworth ..	18	845	10·68	3·85	·411	21·92	3·41	·748
Killarney	20	856	18·74	4·28	·803	23·07	5·03	1·16
Toogoolawah ..	16	770	12·99	3·91	·508	22·02	4·44	·978
Toowoomba No. 1	22	709	17·56	4·33	·76	20·00	5·34	1·067
Toowoomba No. 2	19	875	18·07	4·12	·745	28·78	3·86	1·112
Malanda	22	811	14·83	3·73	·553	29·67	3·08	1·093
Kilcoy	20	802	13·23	3·92	·519	22·24	4·37	·973
Millaa Millaa ..	12	394	12·6	3·92	·494	15·73	3·79	·596

Fat Lamb Production in Queensland.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

(*Continued from page* 48, *January*, 1949.)

MANAGEMENT OF THE FLOCK.

In any branch of sheep raising, flock management is important. Fat lamb raising in Queensland is a more specialised phase of primary production than it is in the southern States, which enjoy good seasonal conditions. The predominantly summer rainfall and the close association between lamb production and agriculture in Queensland necessitate practices which are somewhat different from those applicable in other States. However, the basic principles are quite similar.

Selection of Breeds of Sheep.

Sheep are used to convert crops into cash in lamb production in this State. Accordingly, it is essential to select the breeds of sheep which will do this most efficiently. From the section dealing with sheep breeding, it is seen that the best lambs are likely to be produced by crossing long-woolled rams such as Romney Marsh, Border Leicester, or Corriedale with Merino ewes and mating the female offspring with Dorset Horn or Southdown rams. As the majority of farming lands on the Darling Downs are too valuable to use for the growing of first-cross sheep, the lamb-raiser in that area would be well advised to buy a good line of Border Leicester x Merino, Romney Marsh x Merino, or Corriedale x Merino ewes to mate with Dorset Horn and/or Southdown rams.

The man who wishes to raise lambs but who is situated in areas which are not quite so favoured as the Darling Downs would be well advised to concentrate on first-crosses, such as Border Leicester x Merino, Romney Marsh x Merino, or Corriedale x Merino. The female offspring from such crosses meet a ready sale in the lamb-growing areas as fat lamb mothers. The male offspring can be fattened on whatever crops happen to be available and turned off as heavyweight lamb or young mutton suitable for the local trade. In addition, there is a fairly good return from the wool of such crossbreds. Areas which would be suitable for such a system of husbandry include those as far west as Roma in the south, parts of the Dawson Valley, the Burnett and Callide Valleys, and Peak Downs.

It would be advisable for any farmer who wished to rear sheep in the coastal or subcoastal areas, such as Beaudesert or Laidley, the irrigated areas of the Burdekin basin, the Atherton Tablelands, or Springbrook, to introduce Romney Marsh or Romney x Merino crossbreds.

It is far better to buy a straight, even line of ewes than to retain any females which fail to reach a marketable condition each year to act as replacements. Lambs which fail to reach a *marketable weight* by the time they attain a *marketable age* have really demonstrated their slow-growing and late-maturing qualities and accordingly they are most undesirable as lamb mothers.

Ewe Classing.

The classing of ewes is important to the lamb producer just as it is to the wool grower. The fat lamb mother should produce a profitable fleece as well as breed and rear at least one marketable lamb each year. Accordingly, it is advisable to examine the ewes each year before mating. Besides rejecting the broken-mouthed ewes, any animals which are bad mothers, which have blind teats or defective udders, which are shy breeders or poor wool cutters, or which repeatedly produce unmarketable lambs should be withdrawn from the flock. Failure to do this means that the space and crops which could be utilised by a profitable sheep are given to unprofitable ones; in other words, money is being wasted.

Mating.

The main factor which will govern the date of mating the rams with the ewes will be the amount of feed it is anticipated will be available for the lambs when they are dropped. On the Darling Downs, where winter crops such as oats are utilised for lamb production, it is desirable to drop the lambs between early March and late May, and this means mating between October and January.

As the early lamb is the most profitable, some growers on the Darling Downs mate Dorset Horn and Southdown rams at the same time with the ewe flock. There is field evidence to suggest that the presence of active rams which are keen to work has the effect of bringing ewes on heat and the Dorsets, with their capacity to work, probably have a useful influence in this way.

In other areas the type of crops grown—that is, whether summer or winter—will have the deciding influence on mating time.

Neither ewes nor rams should be over-fat when mated. It is probably advisable to mate 2½ per cent. of young rams or 3½ per cent. of old rams and it is a well-established custom "to flush" the ewes by joining on green feed. This is considered to lead to more frequent twinning. The rams should be in good order for mating and it is unwise to use any animals which have suffered recently from sore feet or any other upset.

Care of the In-lamb Ewe.

Very often ewes in lamb are turned out on to natural pastures and are not brought in until they lamb. This practice is fairly satisfactory when the sheep have been mated in October if good summer rains fall and if the native grasses are of reasonably good quality. If, however,

the summer rains fail, the natural pastures are of poor quality, or the sheep have been mated in the autumn for a spring lambing to catch summer crops in a summer rainfall area, this practice cannot be commended. It is preferable to keep the ewes on a steadily rising plane of nutrition during pregnancy. This will ensure a better milk supply and bigger lambs, particularly if there is a large number of twins, and at the same time will assist greatly in minimising losses due to the so-called twin-lamb disease or pregnancy toxaemia. Where it can be arranged it is preferable to "top the ewes off" during the last month or so of pregnancy. This can be managed quite conveniently after the pre-lambing crutching and will give the ewes a chance to settle down in their new pasture. At the same time it reduces the amount of handling of the ewes to a minimum. Naturally, the extent to which "topping off" can be practised will depend upon the area of the farm and the proportion under crops, but on no account should the ewes be allowed to get too fat.

It is also advisable to keep moving amongst the ewes. This accustoms them to the regular visits which are necessary at lambing time, when it may be possible to help a ewe which is experiencing difficulty.

Many lambs are lost each year as the result of the activities of wild dogs, foxes, eagles, crows, or hawks. This is partly the result of the marked increase in such wild life during the war, but it is as well to make every effort to trap and/or poison these predators before lambing commences.

It is preferable, wherever possible, to lamb the ewes in paddocks which have adequate cover to afford protection for the ewes and their young lambs. Shade is necessary but at the same time good feed for the ewe should be readily available.

Care at Lambing Time.

The gestation period of the ewe is usually stated to be five months, and at lambing time the ewes should be in good strong condition and not over-fat.

Owing to the cold conditions experienced on the Darling Downs during winter it is advisable to use sheltered paddocks for lambing in order to minimise losses of young lambs.

Attention to the ewes at lambing time will pay handsome dividends. If possible, two inspections should be made each day, one early in the morning to assist any ewes which may have got down during the night.

In dealing with ewes which are apparently having trouble in lambing it is as well to remember the following points:—

(1) Do not be impatient; make sure the ewe is in trouble before you interfere;

(2) Always explore the situation thoroughly before exerting any force;

(3) Keep the fingernails short and the hands clean.

Lamb Marking.

Lamb marking, which consists of ear marking, docking the lamb's tail, and castrating the males, is most easily performed when the lambs are very young. It is the aim of the lamb producer to keep the sheep

growing and fattening and to avoid any setbacks. The earlier the lamb is marked the fewer after-effects are experienced, and recovery from the operations is quicker. The time and the method of marking vary from property to property. Most owners quietly draft ewes with lambs out of the lambing paddock into one which contains a crop at a stage suitable for grazing. They then have two or three markings, one every two or three weeks. Others mark the lambs, if they are strong enough, when the ewes are moved from the lambing paddock.

Whatever procedure is adopted it is essential to take reasonable precautions. It is preferable to use temporary yards and, if it is necessary to use a permanent yard, to hold the lambs on an outside fence for the marking operation and drop them on their feet into a clean paddock in which the ewes are confined to allow mothering. Make sure all the instruments are clean, and do not attempt marking during cold, wet weather.

From Marking to Marketing.

Provided the sheep are of the right breeding, correct feeding is the key to the successful production of fat lambs. It is as well to remember that in Queensland, where crops are grown especially for feeding lambs, it is essential that they be utilised with the utmost efficiency, because of the expense involved in preparing for and sowing crops. Lambs which develop rapidly and are marketable at an early age are most profitable because they are on the property a minimum time and they utilise their food with the greatest efficiency—that is, they are off the property before the efficiency with which they convert their food to meat falls, and before they commence to eat an increasingly large amount of the crop to make progressively smaller gains in liveweight.

The way in which the lambs are fed from marking till they are ready for market has an important influence on the quality of the carcase. It is as well to remember that as the lamb grows older there is a steady increase in its nutritive requirements and at the same time a steady decrease in the amount of milk its mother produces. Accordingly, to ensure a steadily rising plane of nutrition for the lambs it is essential to regulate the grazing of crops carefully.

Of the crops grown on the Darling Downs for lamb production, oats is probably the most popular. When treated as a pasture it is perhaps one of the most productive of those grown under "wheat belt conditions" and needs no cultivation other than preparation of the land and seeding. If it is planned to lamb early, it may be worth considering seeding "early" and "late" varieties in different paddocks. A succession of individual sowings between February and June will normally ensure a continuous supply of succulent, nutritious forage essential for best results. Klein, Algerian, Mulga, and Fulghum are the recommended varieties.

In fat lamb production, rotational grazing of the oat "pastures" gives the best result from the point of view of crop utilisation and worm control. This usually involves the crowding of the ewes on to a part of the paddock which is divided off by a temporary fence. It is advisable to keep the sheep on this area until it is eaten down.

Legumes which can be used for lamb production are lucerne and cowpeas. Lucerne is fairly expensive to establish over large areas on account of the careful seed-bed preparation necessary and the problem

of mint weed in infested districts. Grazing should not be carried out until the plants have established a crown. This is usually after the first flowering and shoots appear at the base of the plant. As it is a "long term" project, the first grazing should be light. Once plants are well established they may be grazed whenever there is sufficient growth and this occurs mainly in the warmer months. Lucerne paddocks should not be grazed, however, during dry months when they are comparatively bare. Accordingly, lucerne paddocks may appear unproductive at certain times of the year when compared with those which produce a cereal crop.

The main value of lucerne lies in the quality of the feed it produces and its longevity. Lucerne is rich in protein and, as the growing stage of young animals is virtually a period of rapid protein storage, it is important to provide them with a high protein intake. Another advantage is that any surplus lucerne can be cut easily and conserved.

For rapid fattening of sheep in the summer, cowpeas have few equals. They are particularly handy for finishing off a line of lambs and should be grazed as the pods are reaching maturity. Cowpeas are also rich in protein but unlike lucerne are quick-growing annuals. Unfortunately, a good deal of the plant is wasted by grazing. Sheep do not eat the main stems and these usually blow away and are not available as a source of humus. Cowpeas do particularly well under a wide range of conditions in Queensland. Sown from September to January they mature from December to May, but are susceptible to frost. They can be grown in the 26 inch rainfall zone, but a clean seed-bed is an essential.

Rape is a valuable crop in that it has the capacity, if planted early, of providing feed during the autumn months and may persist right into the following spring provided adequate rain falls.

Sudan grass is a summer grower. It is an annual and has the reputation of being fairly drought resistant. It can be grazed by sheep and is becoming a more popular crop for this purpose. White panicum is another quick growing summer annual which provides a good succession of grazings. However, both of these crops are inclined to be deficient in protein and accordingly, when they are used, care should be taken to provide the sheep with some protein-rich plant such as lucerne or peas.

Unfortunately, permanent pastures of exotic species are not well established in Queensland, but it seems from recent work conducted by C.S.I.R. that *Paspalum scrobiculatum* may be a useful summer growing species for this State. Should this grass do as well in the field as it has under experimental conditions, it seems probable that it will lead to considerable extension of the lamb producing areas in the summer rainfall zones, and after all improved pastures are the key to an established lamb industry.

In marketing it is advisable to forward the lambs as soon as they reach the best weights. It is usually considered that the dressed weight of a lamb is about half its live-weight, though this varies a little depending on breed and age. However, it is inadvisable to hold lambs too long in the hope that they will attain heavier weights. Carcases between 29 and 42 lb. weight are the most popular and holding sheep too long may mean they will get too fat.

The lamb grower on the Darling Downs should aim at selling all lambs, irrespective of sex. Men in the marginal lamb country might consider retaining the female offspring for sale as fat lamb mothers on the Darling Downs.

The quality of the final product depends largely upon the way the lambs are handled when being forwarded to market. Careless work in the yards, forcing lambs into too small an area, throwing sheep over fences, catching them by their wool or prodding them with sticks may cause bruising of the carcase. Many first-grade lambs are rejected from export as the result of such rough handling. If it is necessary to drive the lambs some distance to the trucking yards, it is as well to take a few ewes along with them. It is advisable to start the lambs off for the trucking yards early in the morning or late in the evening so that they will not have to travel during the heat of the day. It is also advisable to allow ample time for work of this nature so that the lambs can cool down and have a drink before going on trucks.

Where motor transport is being used, the trucks usually pick up the lambs on the property and under these circumstances the sheep have not to be mustered until the day they are leaving the property. This reduces the time the lambs are off their mothers prior to slaughtering and means a minimum loss of weight and bloom.

While the object in lamb production is to get the whole drop off to market within about 16 weeks of birth this is seldom achieved. A few animals have to be carried over and marketed later. Sometimes these "carry overs" go off as "summer" lambs 10 or 11 months old.

If lambs are being carried over past Christmas it is advisable to shear them before the summer rains fall. There is no doubt that sheep usually fatten quickly off shears and a December or January shearing reduces the risk of trouble from grass seed.

SHEEP DISEASES ASSOCIATED WITH FAT LAMB PRODUCTION.

The main diseases and parasites affecting sheep are dealt with in greater detail in other Departmental pamphlets. In this section a brief summary is given of diseases of breeding ewes, diseases associated with lamb marking and worm control for the lamb grower.

Diseases of Breeding Ewes.

There are three important diseases which occur commonly amongst breeding ewes in the lamb industry. These are twin lamb disease (pregnancy toxaemia), milk fever (hypocalcaemia), and grass or oat tetany (hypomagnesaemia).

The name twin lamb disease suggests that this complaint is restricted to ewes carrying twin lambs. However, this is not always the case, as it may occur in ewes carrying only one lamb, though under these circumstances affected animals are usually fairly well advanced in pregnancy.

The exact nature of the changes which occur in the ewe's body during the course of this disease is not fully understood, but the condition occurs most commonly when ewes within about one month of lambing are subjected to adverse conditions such as a falling plane of

nutrition. Other factors, such as cold, wet weather, a change of paddock or holding in the yards too long, may precipitate outbreaks. Initially a few intermittent cases occur, but the number of sheep affected increases gradually. The losses cease immediately lambing finishes.

"Milk fever" suggests a feverish condition associated with the production of milk. Actually this is not the case. This disease and grass or oat tetany are caused through a sudden change in the amount of minerals circulating in the blood. Milk fever results from sudden diminution in the calcium content of the blood, while oat tetany occurs when the amount of magnesium carried in the blood suddenly decreases. A large number of factors are known to predispose sheep or to precipitate attacks of milk fever. These include a diet which is deficient in calcium (lime), periods of starvation, exercise, infestation with worms, cold wet weather and certain poison plants. Outbreaks of milk fever often occur suddenly, a large number of sheep being affected at once. Cases may occur prior to, during or after lambing.

As its name suggests, oat tetany often occurs amongst sheep which are grazing on oats. Sheep affected by twin lamb disease, milk fever or grass tetany may present fairly similar symptoms, which include grinding of the teeth, a dull stupor, and disinclination or inability to move. Sometimes the sheep go down and give the impression of being paralysed. The course of twin lamb disease is inclined to be long and drawn out, death following in from 5 to 7 days, whereas in both milk fever and oat tetany it is short. Plate 49 shows a ewe suffering from pregnancy toxaemia.

Both milk fever and oat tetany will respond readily to treatment. The logical thing to do when sheep are affected is to inject some calcium (lime) and/or magnesium. This has the effect of increasing the amount

Plate 49.
A Ewe Suffering from Pregnancy Toxaemia.

of these minerals circulating in the blood. A suitable procedure is to inject the calcium (lime) first and, if there is no response within about 15 minutes, inject the magnesium. If the sheep still does not respond and the symptoms and history are similar to those described it is reasonably certain the trouble is twin lamb disease.

The dose rates are as follows:—For milk fever 30-50 c.c. of a 20% (1 in 5) solution of calcium-boro-gluconate injected under the skin; for oat tetany 15 c.c. of a 5% (1 in 20) solution of magnesium sulphate (Epsom salts).

Precautionary measures include the avoidance of those conditions which are known to predispose animals to attacks of these diseases.

Diseases Associated with Lamb Marking.

There are some important diseases which may affect lambs after marking. They are caused through specific bacteria gaining entrance to the blood stream through the marking wounds. The organisms which cause these diseases are found commonly in the soil, especially in the vicinity of established sheep yards and shearing sheds. Accordingly, these places should be regarded as unsuitable for carrying out marking operations.

Plate 50.
A LAMB SUFFERING FROM TETANUS.

Gas gangrene, malignant oedema, white oedema and tetanus are diseases caused by organisms which are called anaerobes because they cannot thrive in an environment in which oxygen is present. Accordingly, when exposed to the air they develop a strongly protective "seed coat" and in this stage are known as spores. These spores are very resistant to hot dry weather and sunlight.

On entering the lamb's body through marking wounds the organisms which cause gas gangrene, malignant oedema and white oedema soon multiply. They set up a large swelling which rapidly extends and which varies in colour from blackish-red to white depending on the type of infection. Affected lambs become acutely lame and feverish. They are disinclined to eat and usually die within about a week of being marked.

On the other hand, the organism which causes tetanus does not invade the tissues surrounding the wound through which it enters. Accordingly, the marking wounds may appear perfectly normal at all times, but within any time between about 7 and 14 days after marking lambs may become stiff legged and tend to take fit-like seizures. Finally they go down on their sides with their front legs stretched out stiffly. Death usually supervenes. Plate 50 shows a lamb suffering from tetanus.

Two other diseases associated with lamb marking are arthritis and cheesy gland (*caseous lymphadenitis*). In the former condition the causative organism, on gaining entrance to the blood stream through the marking wounds, circulates around the body until it reaches a joint. Here it becomes established and sets up a considerable amount of inflammation. Symptoms of lameness, disinclination to eat and/or drink, general malaise and soreness of the joints may appear in from one to three weeks after marking.

Few lambs die from arthritis but many may be affected and in this way receive a check in their growth. A few lambs become more or less permanent cripples.

The main economic importance of cheesy gland is that affected carcases are rejected for export. The causative organism of this disease may gain entrance through the marking wounds and forms cold abscesses in the various lymph glands. These abscesses are virtually unimportant while the animal is alive and usually escape notice. They are readily detected, however, on postmortem examination at the meatworks.

Worm Control.

Internal parasites have played an important part in governing the distribution of sheep in this State. Largely because of them, sheep raising on the coast has, in the past, been unsuccessful. Worms are controllable, however, by the application of more modern methods.

There are three species of worms which commonly affect sheep in Queensland. These are the barber's pole worm (*Haemonchus contortus*), found in the small intestine, and the nodule worm (*Oesophagostomum columbianum*) found in the "crown" of the large intestine. The barber's pole worm is more common during the summer months, while the hair and nodule worms occur mainly in the winter. All three species are much more prevalent in wet seasons.

The barber's pole worm is a blood sucker and a heavy infestation can produce marked anaemia in lambs.They become unthrifty, pot-bellied and fail to grow. The skin of their eyelids and gums becomes pale and often a soft swelling develops under the jaw. If untreated the lambs may die.

The hair worm causes black scours in young sheep and associated with this symptom there is an apparent inability on the part of the animal to utilise its food. Accordingly, affected lambs do not grow and are hard to fatten.

The nodule worm produces poverty and emaciation in both young and old sheep. The gait becomes stilted and the animals have a peculiarly humped back.

Two important principles are involved in worm control for the lamb raiser. They are:—

(1) Keep the ewes free from worms.

(2) Feed the lambs well.

The worm burden carried by the ewes can be kept at a minimum by drenching these sheep twice a year, once in late April or early May and once in mid-August, with phenothiazine (which is effective against the common worms) and using bluestone and nicotine sulphate during the winter and bluestone and arsenic during the summer, as the season demands. It is good policy to drench the ewes prior to lambing but care should be taken not to use phenothiazine within about four weeks of lambing. After drenching, the ewes should if possible be put into a clean paddock—that is, one which has not been stocked for three or four weeks.

It has been demonstrated clearly that well fed lambs are not as likely to suffer from worm infestation as are poorly fed animals. It is also known that rotational grazing of pasture is helpful in that it breaks the life cycle of the worms and minimises the risk of reinfestation. Accordingly lambs whose mothers have been drenched prior to lambing, and which are well fed and moved from one paddock or part of a paddock to another at least every three weeks, have a reasonable chance of fattening well and not requiring any anthelmentic treatment. Should this be necessary, however, the phenothiazine drench is probably the best to use.

ACKNOWLEDGEMENTS.

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The assistance of officers of the Division of Plant Industry, Department of Agriculture and Stock, and of various men interested in and familiar with the lamb industry in Queensland is also acknowledged.

Most of the photographs have been supplied through the courtesy of *Queensland Country Life*, and appreciation of this assistance is recorded.

The Production of Poultry Meat.

P. RUMBALL, Officer-in-Charge, Poultry Branch.

THE relatively high price now being paid for poultry meat is inducing many farmers to give consideration to a phase of poultry raising that has been sadly neglected in the past.

It is necessary for the guidance of those intending to raise poultry for meat to stress the fact that a very large percentage of the poultry slaughtered in the Brisbane area is being exported overseas. The export trade is responsible for the present prices and only birds that are well-fleshed, free from deformities, and, when dressed, attractive in appearance are suited for this trade.

Demand.

Although there is a sale for small, young birds weighing from ¾ to 1¼ lb. upon the local market for grilling purposes, the demand is limited. The market at present is unlimited for young males of a minimum of 3 lb. for export purposes. It is necessary, however, that the farmer when marketing study the feather development. Birds with excessive pin feathers, especially black-plumaged birds, do not dress attractively enough for export. The ruling price for hens of export quality is also highly attractive. Those that are to be marketed should not be retained until they have commenced to moult and are smothered in pin feathers. Farmers specialising in the production of table birds, should, for economic purposes, confine their attention to cockerels.

Where to Procure Chickens.

For economy in production it is necessary for chickens to have a good start in life and to see that mortality is kept down to a minimum. For this reason it is recommended that buyers of cockerels obtain their supplies direct from a hatchery. Hatchery chickens have not been exposed to the possibility of chills, as is often the case with chickens sold in markets, nor have they been exposed to infection from adults.

Methods of Rearing.

It is necessary for success to give cockerel chickens the same careful attention that is given to the raising of their more valued sisters. They should be reared in brooders until they have reached that stage of development when heat is not necessary for their well-being. This stage would be when they are from 3 to 4 weeks of age in warm weather and may extend to 6 weeks in the winter.

At six weeks of age they could be placed in batteries, and housed intensively or semi-intensively until they have reached that stage of development at which they are to be sold. In rearing for table purposes it is necessary to obtain the maximum growth for the minimum expenditure of food and time. Good feeding and some curtailment of freedom assist this objective. Under either of the foregoing methods of rearing, the birds are kept close to the feed supply and food is not used for maintenance to the same extent as with birds on range.

Battery Rearing.

Batteries consist of a series of cages which may be erected in tiers in existing sheds or as a special unit outside. If a special unit, tiers are not recommended. The structure should be erected upon stumps of convenient height for working. Special units need to be well-roofed to give the necessary protection, and, as the birds are close to the roof, thatching is suggested.

The sections of the battery should be made to hold 10 to 16 birds at 6 weeks of age, and, as the birds develop, the number in each section reduced until only about half the original number is confined in each section by the time they are fit for market.

Batteries with sections 30 inches square and 20 inches high are recommended. The floor of the battery should be 1-inch square woven wire or wire-netting. If the battery is erected in tiers, it will be necessary to have dropping trays below each tier. These trays and the floor under the lower tier should be cleaned daily. Where batteries are erected in the open the back should be closed but provision should be made for ventilation on hot days. Partitions between sections could consist of wire netting, but, if the section is long, erect a closed section every 5 to 6 sections to check drafts. Feed and water vessels for convenience of working are hung outside the front of the battery. For this reason the front is constructed of upright wire or thin slabs of wood spaced sufficiently wide apart to allow the bird's head to pass through. If Leghorns are to be reared to an advanced age, front sections suitable for 6-weeks' old chickens will be too narrow for the older birds. It is better, as numbers have to be reduced from time to time, to have separate sections for older birds.

House or House and Yard Rearing.

Cockerels may be successfully reared in houses only or in houses with run attached. It is very desirable to restrict the area of the run and have as few in a group as the general farm plant will allow. It is appreciated that upon many farms with the existing buildings small numbers would not be economically sound.

Where cockerels are to be reared in houses with runs, it is as well to commence by allowing for 6-weeks' old birds two square feet of floor space in the house. This space will be sufficient until the birds are well enough grown to market and there will be no need to reduce numbers as they grow.

In the intensive system one could start by allowing cockerels of the same age three square feet of floor space in poultry houses built for 100 adults. This is not sufficient for well-grown birds. Cockerels do not all grow at the same rate. The larger birds could be disposed of probably

at 12 to 14 weeks of age, which would leave enough room for the balance. Birds of about 14 weeks of age would require 3½ to 4 square feet according to the breed. In small sheds a greater space per bird should be allowed.

Rate of Development and Food Consumption.

The following tables, giving the average weight of birds at varying ages and the average feed consumption to that age, have been compiled from experiments conducted by this Department. Similar results can be obtained by most people with reasonable care and attention.

Table 1 indicates very definitely that for the economic use of food it is necessary that the ration supplied to the birds from 6 weeks of age contain protein at a level of at least 15 per cent. During the early stages, that is, when the birds are from 6 to 8 or 9 weeks of age, a higher level might be an advantage. From day-old to six weeks a starting mash should be used.

A comparison of Table 1 and Table 2 suggests that there is little advantage, if any, in battery rearing as compared to pen rearing when the food required to produce a pound of poultry is compared. With batteries one can handle greater numbers in a confined area, but the greater the confinement the greater the need for sanitation.

The tables also indicate that, as the birds age, a greater quantity of food is required for each pound gained. Farmers should compare food consumption and development with these tables and calculate from time to time the cost of production.

Feeding.

The nutrients required by young chickens, growing stock and adults have been definitely determined by poultry nutrition authorities.

The most practical approach to the subject, therefore, is to become familiar with the requirements of the different age-groups and the foodstuffs that will supply these nutrients.

In the usual material used for feeding many of the nutrients are not in short supply and for practical purposes it will suffice if only those nutrients that are frequently deficient in rations are considered at present.

TABLE 1.

Battery Reared Australorp Cockerels.

Table showing the age in weeks and the weight of the birds and the amount of food consumed, using rations with a crude protein content of 13%, 15% and 17%.

Age in Weeks.	13 Per Cent. Protein.		15 Per Cent. Protein.		17 Per Cent. Protein.	
	Weight of Bird.	Weight of Food Consumed. from Day Old.	Weight of Bird	Weight of Food Consumed.	Weight of Bird.	Weight of Food Consumed.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
6	1·35	2·7	1·31	2·7	1·32	2·7
9	1·9	5·9	2·35	5·9	2·45	5·99
12	2·8	9·8	3·2	9·8	3·5	10·2
15	3·45	13·9	4·01	13·9	4·4	14·8

Note: In calculating the protein content of the ration all types of food given must be assessed.

TABLE 2.

COCKERELS REARED UNDER HOUSE AND YARD SYSTEM.

Table showing the age in weeks, the weight of the birds and amount of food consumed. In addition, the amount of feed necessary to produce one pound of body weight is also shown. The ration used in the two tests had a crude protein content of 17%.

Age in Weeks.	Average Weight Bird.	Average Food Consumed.	Amount Feed Produce One Pound Body Weight.
	Lb.	Lb.	Lb.
WHITE LEGHORNS.			
8	1·33	3·42	2·57
10	1·80	5·28	2·93
12	2·16	7·30	3·37
14	2·64	9·29	3·51
16	2·98	11·25	3·57
18	3·19	13·48	4·22
AUSTRALORPS.			
8	1·71	3·97	2·32
10	2·40	6·22	2·59
12	3·06	8·77	2·86
14	3·76	11·28	3·00
16	4·52	14·13	3·12
18	5·31	17·36	3·26
20	5·85	20·85	3·56
22	6·47	24·00	3·70
24	6·76	26·95	3·98

As mentioned previously, protein is necessary for economical development. At least 20 per cent. of the protein content of a ration should be of animal origin—i.e., protein meals and milk products.

Vitamin A deficiency is not uncommon. The vitamin is short in all rations composed of white grains and even yellow maize cannot supply the full needs. Good green feed is the cheapest source.

Vitamin D deficiency is noted when the birds do not have access to direct sunlight. When they have this, supplemental vitamin D is not required.

TABLE 3.

LEVELS OF SOME ESSENTIAL NUTRIENTS.

Nutrient.	Amount per Pound of Feed.		
	Chickens. Day Old to 8 weeks.	Growing Stock. 8 to 20 weeks.	Layers, Breeders.
Crude Protein—Per cent. ..	18–20	16	15
Vitamin A—			
Inter. Units..	2,000	2,000	3,300
Vitamin D—			
A.O.A.C. Units	180	180	450
Riboflavin—mgm.	1,600	Not known	1,250
MINERALS.			
Calcium—Per cent.	1·0	1·0	2·25
Phosphorus—Per cent. ..	·6	·6	·75
Salt—Per cent.	1 to·5	1 to ·5	1 to ·5
Manganese—mgm.	25·0	..	15·0

TABLE 4.

Average Vitamin Content of Some Feedstuffs.

Kind.	Vitamin A. per lb. Inter. Unit.	Vitamin B1. per lb. Inter. Unit.	Vitamin D. per lb. A.O.A.C.	Vitamin E.	Vitamin B2. (Riboflavin) M/grammes per lb.
Barley	400	250	Trace	xx	400
Maize (Yellow)	3,180	270	*	xx	450
Maize (White)	0	270	*	xx	450
Cowpeas	1,360	450	*	*	400
Milo	250	*	*	*	400
Oats	80	270	*	xx	400
Peanut Meal	150	900	*	xx	1,200
Wheat	140	340	*	xx	400
Wheat Bran	150	450	*	xx	1,000
Cottonseed Meal	600	1,800	*	*	300
Linseed Meal	200	2,000	*	x	900
Buttermilk, Dried	200	400	Trace	x	9,000
Cod Liver Oil	340,190	0	45,360	0	0
Liver Meal	*	*	*	*	18,500
Meat Scrap	*	*	*	*	2,700
Green Lucerne	53,560	225	*	xx	2,000
Lucerne Meal	13,000	400	*	xxx	5,000
Lucerne Leaf Meal	32,000	400	14	xxx	7,000
Pollard	120	1,000	*	xxx	900

* Information on vitamin content is lacking.
† No appreciable quantity.
xx Good source.
xxx Very good source.

Riboflavin deficiency is noted on many farms. Milk products and liver meals are the commonest sources for building up the ration with this vitamin. A synthetic product is now available.

Birds having free access to shell-grit are provided with their calcium needs, but, in raising birds for table purposes, ground limestone or shell-grit as an addition to the mash is necessary at the rate of 1 to 2 per cent.

TABLE 5.

Average Mineral Content of Some Feedstuffs.

Kind.	Calcium.	Phosphorus.	Manganese.
	Per cent.	Per cent.	Parts Per Million.
Barley	·05	·36	16
Maize (Yellow)	·01	·29	5
Milo	·04	·32	15
Oats	·10	·44	20
Wheat	·04	·39	39
Wheat Bran	·11	1·21	119
Wheat Middlings	·08	·93	119
Buttermilk, Dried	1·56	1·05	4
Meat Scrap	8·25	4·00	18
Green Lucerne	·42	0·7	7
Lucerne Meal	1·44	·21	26
Lucerne Leaf Meal	1·90	·22	30

ALL MASH—CHICKENS DAY-OLD TO 6 TO 8 WEEKS.

Ingredient.	Mixtures.			
	1.	2.	3.	4.
Yellow Maize Meal	38	..	..	20
Wheat Meal	..	43	43	20
Sorghum Meal	..	20	20	25
Bran	20	20	15	10
Pollard	20	..	..	..
Lucerne Meal	..	..	5	5
Protein Meal (55 per centi)	9	9	14	12
Buttermilk Powder	10	..	..	5
Liver Meal	..	5	..	..
Ground Limestone or Shell	1	1	1	1
Synthetic Riboflavin	..	..	As directed by vendor	As directed by vendor
Vitaminised Preparation	1	1	1	1
Manganese–Salt Mixture*	1	1	1	1
	100	100	100	100

* Manganese–salt mixture consists of a mixture of 4 ounces of commercial manganese sulphate and 20 pounds of common salt.

Manganese deficiency occurs where rations are more or less devoid of mill offals. The use of commercial manganese sulphate overcomes the shortage. Excess of either calcium or phosphorus will also reduce the availability of manganese.

Tables 4 and 5 indicate the vitamins and the sources of the essential minerals of foodstuffs commonly used in poultry nutrition. These tables will assist in compiling rations.

ALL MASH—GROWING BIRDS 8 TO 20 WEEKS.

BIRDS HAVING ACCESS TO DIRECT SUNLIGHT.

Ingredient.	Ration.			
	1.	2.	3.	4.
Maize Meal	35	..	..	..
Wheatmeal	30	40	51	66
Sorghum Meal	..	22	12	..
Bran	10	10	..	20
Pollard	20	10	20	..
Lucerne Chaff (Leafy)	4	4	6	4
Protein Meal	5	8	9	6
Ground Limestone or Shell	1	1	1	1
Manganese–Salt Mixture	1	1	1	1
Liver Meal	4	..	..	2
Milk Powder	..	4	..	2
Synthetic Riboflavin	..	..	As directed by Vendor	..

Suggested Rations.

The all-mash method of feeding is recommended in producing table poultry and suitable mixtures are suggested here.

No special fattening process is suggested. Young birds that have received suitable rations should at all stages be well fleshed. Any gains in weight that might follow any special fattening process are due to an increase in growth.

Crushed grains, owing to the shortage of mill offal, will have to form the bulk of rations. Grains should not be finely ground. Better development is associated with mixtures of a granular nature.

If a good succulent green feed is not available to be fed in conjunction with these mashes a vitamin A preparation should be used as a supplement.

Owing to the impossibility of obtaining a wide range of ingredients, mixtures have to be very simple. Where bran is not available a good sample of crushed whole oats would make a useful addition. Oats of good quality are a valuable food. They have been omitted as they are not usually available.

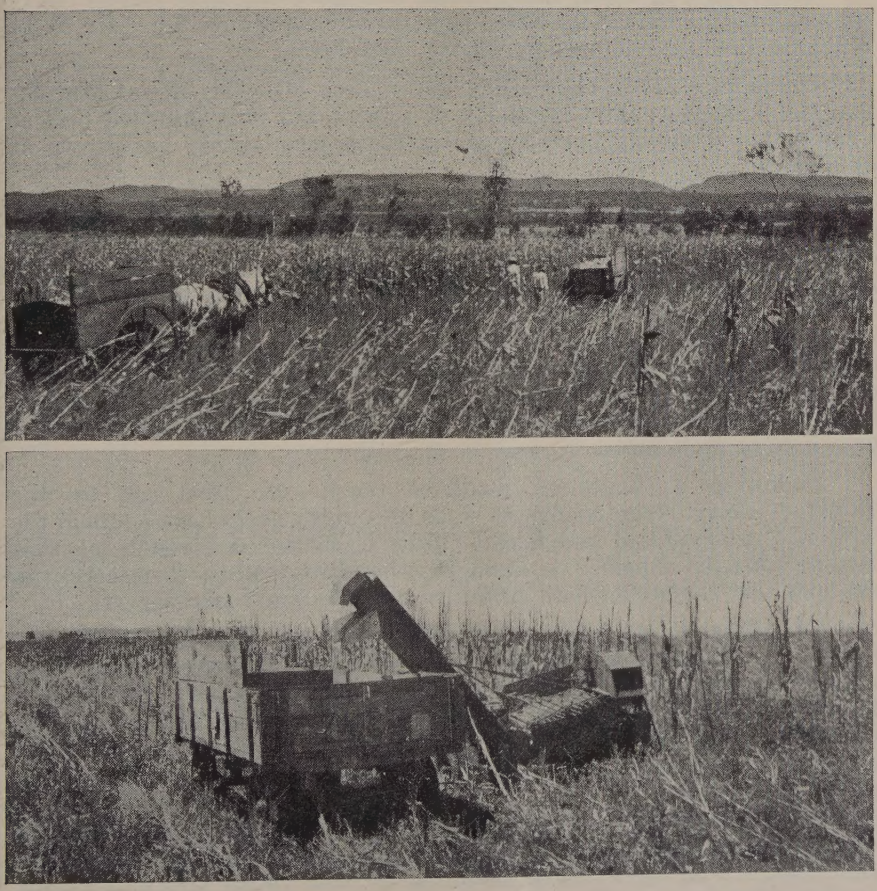

Plate 51.
THE OLD AND THE NEW IN MAIZE HARVESTING ON THE ATHERTON TABLELAND.

Junior Farmer Clubs.

THE opening of the year saw new Junior Farmer Clubs established at Murgon, Helidon, Bauple, and Goomboorian, while others ready but awaiting the visit of the State Director of the organisation (Mr. T. L. Williams) included Killarney, Allora, and Tiaro.

The three clubs in the Callide Valley area (Biloela, Mount Murchison, and Thangool) meet regularly at Biloela, but it is expected that at a later date these will operate separately, as membership has grown at each centre.

Nominations called for the Australian Broadcasting Commission's grand championship competition for junior farmers for 1949, to be conducted at the Sydney Royal Show next Easter, brought forth quite a number of applications from members of the organisation in Queensland. These members will undergo a preliminary test in Brisbane in March, when this State's representative will be selected. Added interest is attached to this year's competition by reason of the fact that the champion junior farmer from New Zealand has been invited to participate in the contest, in open competition with Australia's best junior farmers drawn from each State.

Following a suggestion made to them some time ago by the Director, several recently-formed clubs in country areas have adopted the title of "Agricultural and Social Clubs," the reason given being that members can be expected to band together better when their activities are such that they cover both agricultural study and social aspects.

As "all work and no play" is just as applicable to the junior farmer movement as in other directions, Mr. Williams is encouraging most centres to use such a title. Not only will it give greater opportunities for these young men and women to work together as agricultural "study groups," but it will afford them an opportunity of improving the local community themselves or work in conjunction with other recognised public bodies, each body concerned sharing expenses and, of course, profits. By this means, he added, initiative of purpose, team spirit and work and the creation of ideas in the running of various forms of public functions will be developed in the minds of these young men and women, at the same time enabling them to build up a small cash fund from which can be met library and minor expenses.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL, 1949.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	20	38	Longreach	31	39
6	6.00	5.41	Charleville ..	26	28	Quilpie	36	34
11	6 02	5.36	Cloncurry	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	28	Roma	16	18
21	6.08	5.26	Dirranbandi ..	20	18	Townsville ..	18	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	7.56	7.08
2	8.52	7.42
3	9.49	8.22
4	10.48	9.07
5	11.48	10.00
	p.m.	
6	12·45	11.00
7	1.38	..
		a.m.
8	2.26	12.05
9	3.10	1.12
10	3.49	2.20
11	4.25	3.28
12	5.01	4.36
13	5.37	5.44
14	6.16	6.53
15	6.59	8.02
16	7.46	9.12
17	8.39	10.19
18	9.37	11.21
		p.m.
19	10.36	12.17
20	11·35	1.04
21	..	1.45
	a.m.	
22	12.33	2.20
23	1.29	2.51
24	2.22	3.19
25	3·14	3.46
26	4.05	4.13
27	4.57	4.41
28	5.51	5.10
29	6.46	5.43
30	7.43	6.22

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	14	25	29	41	4	17	33	49
6	9	30	25	45	0	21	26	54
11	17	23	33	39	8	14	37	44
16	30	11	45	25	20	0	53	52
21	27	12	43	26	18	1	50	29
26	19	20	35	37	10	11	39	42
30	12	29	27	44	1	19	29	52

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	17	44	41	60	26	46	15	37
3	8	52	36	65	21	50	8	44
5	2	56	33	67	17	53	3	46
7	5	52	35	65	19	50	5	44
9	13	48	39	62	24	48	12	40
11	25	37	47	56	32	41	21	32
13	38	24	56	46	41	31	32	21
15	50	11	64	38	48	23	41	11
17	56	3	68	32	52	18	46	4
19	55	2	68	32	51	17	45	3
21	47	8	63	36	47	21	39	8
23	43	17	60	42	45	27	36	16
25	34	27	53	48	38	33	28	23
27	23	37	46	56	30	41	20	32
30	9	51	37	64	21	50	8	43

Phases of the Moon.—First Quarter, 6th April, 11.01 p.m.; Full Moon, 13th April, 2.08 p.m.; Last Quarter, 20th April, 1.27 p.m.; New Moon, 28th April, 6.02 p.m.

On 15th April, the Sun will rise and set 12 degrees north of true east and true west respectively, and on 12th and 26th April the Moon will rise and set approximately at true east and west respectively.

Eclipses.—On 13th April there will be a total eclipse of the Moon, but it will not be visible from Australia; and also on 28th April the partial eclipse of the Sun will not be visible from Australia, the limits of the eclipse area being confined to the Northern Hemisphere.

Mercury.—A morning object, in the constellation of Pisces at the beginning of the month when it will rise nearly one hour before the Sun. On the 13th it will be in line with the Sun after which it will become an evening object, and on the 30th, in the constellation of Taurus, will set nearly an hour after the Sun.

Venus.—Too close in line with the Sun for observation, being in Superior conjunction with the Sun on the 16th.

Mars.—Now rising before the Sun but still rather close to the Sun for observation. By the 30th it will rise only 45 minutes before the Sun.

Jupiter.—In the constellation of Sagittarius, will rise about mid-day at the beginning of April and between 10.45 p.m. and 11.45 p.m. at the end of the month.

Saturn.—On the 11th, in the constellation of Leo, just to the east of Regulus, will rise during the afternoon and will set about 3 hours after midnight. By the 30th it will set about one hour after midnight.

Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th April. (For every degree of longitude we go west the time increases by 4 minutes.) The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets, which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.